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STEEL

ESTABLISHED 1882

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STEEL
PRODUCTION • PROCESSING • DISTRIBUTION • USE

As the Editor Views the News

■ STEEL production last week (p. 21) dropped ½-point to 54 per cent of ingot capacity. This week will see a sharp drop in both production and consumption levels due to the holiday and plant vacations. But prompt recovery is indicated and current expectations (p. 75) are that steel production during most of July and August will be at about last week's rate. STEEL'S index of industrial activity (p. 35) has moved up for the third successive week. . . . May machinery exports (p. 32) soared close to the all-time record. . . . Under the spur of national defense needs (p. 27) orders continue to flow in unprecedented volume to the airplane and airplane parts industry. . . . How long will our petroleum reserves last? A well-known authority estimates (p. 18) that 150 years is not too high.

• • •

Many New Tools

This year's National Machine Tool exposition will reveal many new tools of previously unheard-of speeds and accuracies. That is the conclusion by Guy Hubbard, STEEL'S machine tool editor. In his visits to most of the country's leading machine tool plants he has been privileged to see much new equipment that will be unveiled at the show. He believes (p. 15) that the show will be a real stimulus to modernization, with resultant increased employment. . . . Space at the National Metal exposition, to be held (p. 30) Oct. 23-7 in Chicago, has been reserved to the extent of 95 per cent. . . . A new type of galvanized equipment is available (p. 21) for the production of exceptionally tight-coat galvanized sheets for deep drawing and forming operations.

• • •

To Help Farmer?

The new Ford tractor was introduced last Thursday (p. 19) before an army of newspapermen as a new device for revolutionizing farming and taking the "red ink" out of that occupation. It utilizes an entirely new principle of attaching implements and has wide diversity of application. . . . At Washington, the temporary national economic committee is studying the construction industry. Last week's testimony revealed (p. 26) that 85 per cent of the houses erected in 1938 were priced beyond the reach of more than half of the urban population. It was held that present conditions call for houses that can be sold at between $2000 and $4000. . . . Hearings on contemplated revision of the national labor relations act continue to be held (p. 25), but indications are that no action will be taken at this session of congress.

• • •

Quick Work

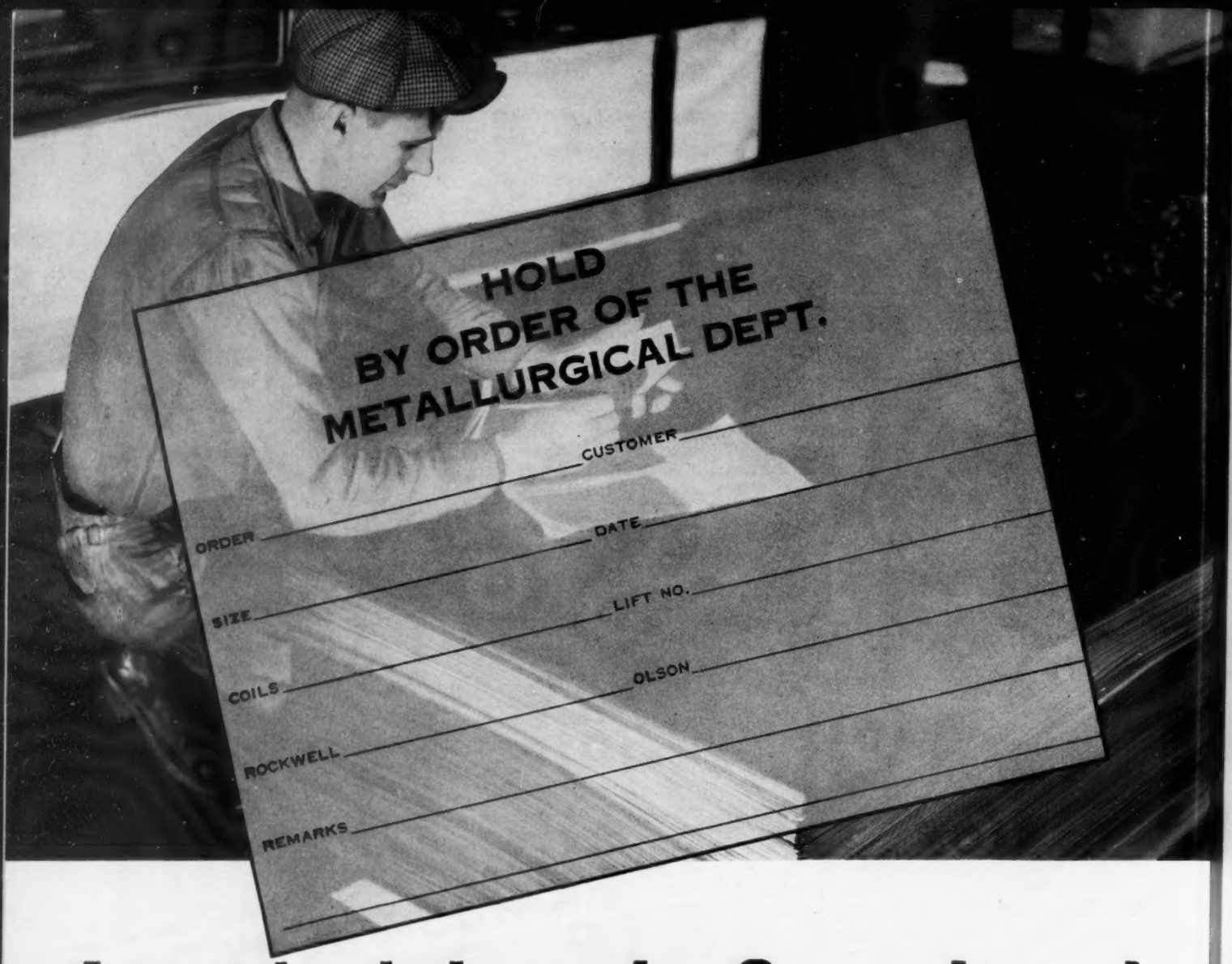
An outstanding installation for production of automotive die castings is that at the new plant of Ternstedt division of General Motors Corp., Trenton, N. J. By efficient tooling and conveyor system (p. 38) only two hours elapse in some cases between receipt of raw materials and shipment of finished product. . . . A roundtable discussion on steels for low-temperature service was a principal feature at the annual convention, last week, of the American Society for Testing Materials; the gaps in existing information (p. 40) were indicated. . . . Of special interest in a new plant for lightning and conventional testing of transformers (p. 46) are a conveyor system and special safety devices in the lightning test room. . . . A definite move is under way (p. 57) toward development of standards for plating.

• • •

Rolling Control

The first of a series of articles (p. 52) on rolling mill control considers the modern mill as an electrical engineering problem and the fundamental importance of instrumentation. The new recording and remote indicating radiation pyrometers offer great possibilities; they are so fast and sensitive as to record differences between ends and centers of rapidly moving slabs. . . . Practically 70 per cent of the welded footage in the new lightweight, high-tensile, low-alloy steel box cars is spotwelded with units (p. 61) that employ automatic pressure, current and timing devices. . . . Two nickel-clad steel plates recently rolled (p. 58) measured 152 x 151 inches and 0.75-inch thick. . . . Choice of color is assuming greater importance daily (p. 66) as a factor in industry.

E C Kreutzberg



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SHEETS STRIP TIN PLATE BARS PLATES FLOOR PLATES STRUCTURALS PILING RAILS TRACK ACCESSORIES REINFORCING BARS

Show To Emphasize Four Years' MACHINE TOOL PROGRESS

By GUY HUBBARD
Machine Tool Editor

■ ERAS are apt to be "dated" by important events associated with them. Sometimes these events have been expositions, the Philadelphia Centennial and the Columbian in Chicago, for example.

Expositions unquestionably have done more than to serve as milestones of progress. They actually have been influential in shaping events and in inspiring progress. That, I am convinced, is true particularly in the case of machine tools. I make this statement on the basis of 25 years' intimate acquaintance with the machine tool industry, during which time I have visited most of its plants in this country and have attended most of the shows in which it was represented to any important degree.

Twenty-five years ago the machine tool industry in general did not move forward on any such united front as it does today. As a matter of fact, as I look back I recall that we did not think of it as a solidified industry. It was something like what someone once referred to as "the Disunited States of America under the Articles of Confederation."

Each company was inclined to consider itself first and foremost as a builder of lathes, planers, shapers, milling machines, turret lathes, drilling machines, or what not. Secondly it considered itself as a supplier of metalworking equipment to some particular industry—railway, textile machinery, power plant equipment, or steel mill machinery.

For instance, the company with which I was connected literally had railroad shops "on the brain," and so made a practice of exhibiting only at railway equipment shows. A major operation in the shape of a change in sales representation aroused this company in the nick of time to the growing possibilities of the automobile industry. This broadened viewpoint led to rapid expansion and to still further diversification of markets. This same thing happened to many other machine tool companies at about that time.

Sectionalism Hindered Progress

A number of years were to elapse, however, before the problem of scattered shows, with their limited localized attendance and their narrow scope, was to be solved through united action of the machine tool builders. In the meantime, progress in engineering development and in marketing methods was hampered by such individualistic conditions within the industry.

About the time when the National Machine Tool Builders' association finally did develop sufficient strength and prestige to put on its own national machine tool show in 1927, there appeared in one of the popular magazines a story entitled "Van Winkle, '07 Comes Back." This dealt with the amazing changes faced by a 1907 graduate who returned to his New England alma mater for the 1927 commencement after 20 years in China.

Now, that 1927 show was a truly remarkable achievement considering that the association, much smaller then than it is today, not only had to start "from scratch" but also had to buck the competition of the considerable number of other and long established expositions in which many of its members participated. There was nothing the matter with the show, but after studying it carefully I did sense that there were certain things the matter with the industry.

Having in mind the above mentioned Van Winkle story, I began to wonder what Van Winkle would have thought had he been a mechanical engineer who had come direct to this show after his 20 years in China. Here were some of my conclusions as to his thoughts:

"Why are not more machine tool builders represented in this, their own show? Why is it that so many machine tools look almost exactly as they did 20 or even 25 years ago? Why is it that after 20 years some machines have not yet caught up with the possibilities of high speed steel cutting tools? Why haven't electrical drive and control made more headway in the machine tool industry in the past 20 years? With antifriction bearings an old story everywhere else, why are 1927 machine tools still using so many plain

bearings? Why are some machine tool gears still so noisy after all these years of gear development by this industry itself?"

Bear in mind that all this thinking was as of 1927.

Encouraged with the success of the 1927 show, the National Machine Tool Builders' association held another and larger one in the fall of 1929. Unfortunately this show came at almost the same time as the memorable market crash of that year. Hence it became associated in the minds of many with the end of an era of good business and the beginning of a great depression.

Real Significance of 1929 Show

That association of ideas is unfortunate, because the 1929 show was in many respects the most significant of any yet held. Had Van Winkle returned on that occasion, he would not have been disappointed as he was in 1927. Since 1927 styling had "taken hold," and machine tools no longer looked as they did 20 years before. They had caught up with the possibilities of high speed cutting tools and some of them were even capable of making effective use of the new and widely discussed cemented carbide tools, which back in 1927 had been largely a matter of hearsay.

Electrical drive and control were in common and successful use on the 1929 machine tools, and hydraulic operation, another somewhat vague possibility in 1927, likewise was strongly in evidence. As far as gears were concerned, the finest were to be found in the 1929 machine tools, so the customers no longer were able to bring up the old adage about the shoemaker's children going barefoot.

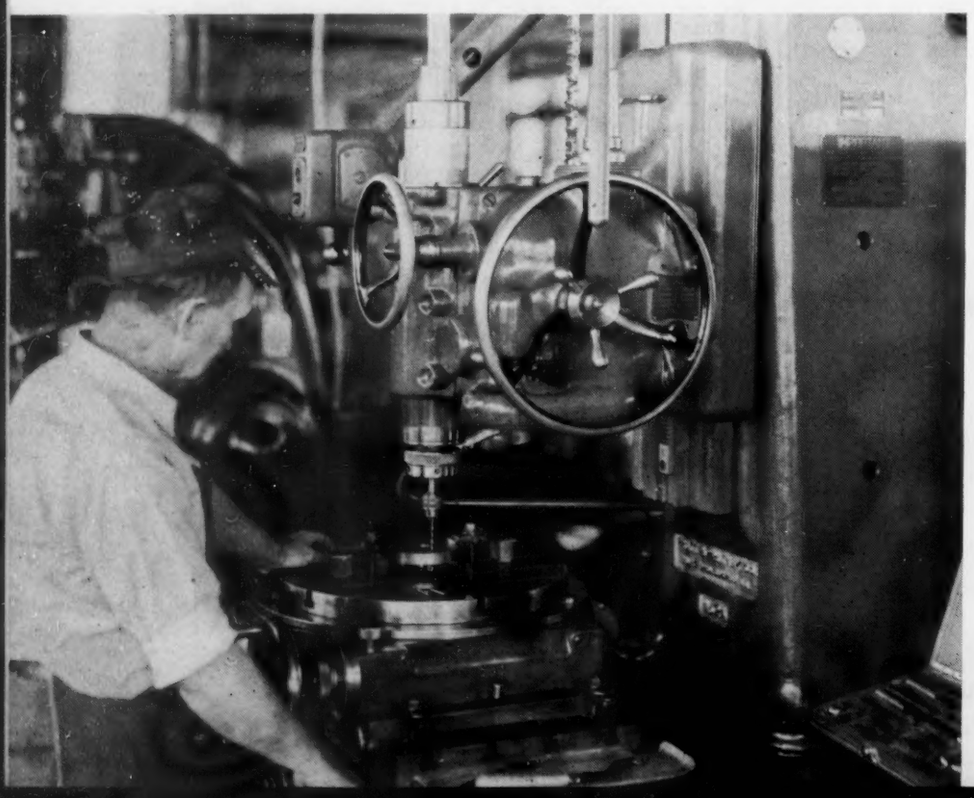
Why all this concentrated progress in the short period between 1927 and 1929? The answer, I am convinced, is this: The machine tool builders' own show in 1927 had served as nothing else ever had served to bring the whole industry together, to make it conscious as never before that it was an industry, and then had caused it to move forward on a united front. In other words, the 1927 show had much the same influence on the machine tool builders as did the Constitutional convention of 1787 on the scattered states which thereafter were in the true sense the United States of America.

■ Increased power and rigidity of milling machines insure speed and smoothness when multiple cuts are involved

The result of so many machine tool builders and their products being brought together under one roof for the first time in 1927 was that they all gained much more respect for each other's ability than they ever had had before. Some of the more conservative ones undoubtedly came to realize that they might have to move at a more lively tempo if they were to keep up with the pacemakers in the industry. This applied to designs as well as marketing methods. Improvements such as already have been mentioned, therefore, gained impetus which within two years caused their general adoption.

The foregoing is not intended to be an argument for bi-yearly model changes in the machine tool industry because that kind of thing does not belong in this business. It is proof, however, that engineering progress even in a conservative industry cannot be made to stand still, and that if improvements are not made gradually there will come a time when the choice must be made between sudden drastic "catching up with progress" or "falling by the wayside." A lot of catching up was done between 1927 and 1929.

Now passing over the pains of the worst of the depression from 1929 to 1935, we find the machine tool industry emerging with enough courage and faith in the future to put



■ Jig boring machines, no longer confined to tool rooms, are being applied to precision operations on production

■ **Turret lathes have been made safe and easy to operate through analyses of action and location of their controls**

on another machine tool show, on a really grand scale in the fall of 1935. When it is considered that no industry was any harder hit by the depression than this one, the amount of backbone required successfully to promote such an undertaking at such a time can well be appreciated.

This 1935 show hardly could have been better timed. It revealed to machine tool users the fact that machine tool brains had been busy throughout the depression even though the shops had not. It unveiled a great number of new machines designed to meet new labor conditions and new manufacturing requirements. Operating convenience and high accuracy were among the outstanding features, and no manufacturer facing the new conditions could afford to be without either one. This show either caught the machine tool market just at the upswing, or it generated that upswing. I am inclined to take the latter view.

What of the 1939 national machine tool show, which the National Machine Tool Builders' association has just announced is to be held in Cleveland, Oct. 4—13? It is risky business these days to do any predicting, but I will go so far as to say that this 1939 show, like the previous one in 1935, will prove to be exceedingly well timed in relation to the general economic cycle.

As far as the exhibits are concerned, there is a great deal that I could say, all of it highly favorable, but it is a little too early yet to be too specific in that direction.

For several months past I have spent a great deal of time traveling, and have visited the plants of most of the leading machine tool builders. In practically every case their plans and their equipment for the 1939 show are much further along than they were at a comparable time prior to the 1935 show. Some of them actually have their machines ready and have them set up in their own plants in spaces corresponding to those which they will occupy in the exposition hall in Cleveland.

I am convinced that the forthcoming show not only is going to be the largest of its kind but also the smoothest running. In many plants I have found intensive training under way, of the picked men who will handle the demonstrations.

As to the machines themselves, I have had previews of some amazing things destined for public unveiling at the forthcoming show. Suffice it to say that there are numerous developments which without question are going to jar loose big chunks of that heavy percentage of worn-out and outmoded machine tool equipment which continues to hamper recovery and development in American industry.

Surprises in Store at 1939 Show

I have seen machines and tooling setups developed to meet the exacting requirements of the aircraft industry for accuracy and surface finish. When these are shown in October, many other industries are going to wake up to the fact that they need the same accuracy and surface finish. They cannot get such accuracy and finish on their old equipment. Hence the only answer will be these new machines.

I have seen machines operating at previously unheard of speeds, not because the tools are in any way unusual but because the rigidity, smoothness and coolant delivery of the machines have been improved along highly scientific lines.

In other cases I have seen the

(*Please turn to Page* 73)

■ **Popularity of turret setups is increasing on work involving multiple operations, even on relatively short runs**

Fourteen Hundred at Testing Society Meeting; Action on Many Standards

■ TRIBUTE to American metallurgists for their development of ferrous and other metal alloys which have played so important a part in the production of petroleum was paid by T. G. Delbridge, president, American Society for Testing Materials, in opening the forty-second annual meeting of the society, Chalfonte-Haddon Hall, Atlantic City, N. J., June 27-30.

Mr. Delbridge, who is manager, research and development department, Atlantic Refining Co., Philadelphia, devoted his address to some "Glimpses at Petroleum," reviewing the growth of the industry since the first wells were drilled in Pennsylvania 80 years ago. He pointed with pride to A.S.T.M. contributions to this industry, both directly and indirectly.

The American petroleum industry is of considerable importance to the society for several reasons, he said "As consumer, the producing refining, transportation, and marketing branches are purchasers of large quantities of metal, both ferrous and nonferrous; of cement, timber and paint; rubber, textiles and electrical supplies. In fact, all branches of the industry are sizable consumers of nearly all the materials now within the scope of the A.S.T.M."

Petroleum Reserve Estimated

Expressing some opinion as to how long our petroleum reserves are likely to last, Mr. Delbridge stated: "If the 1908 estimate had been correct, we would have no petroleum today. If the 1918 estimate had been correct, this country's petroleum would have been exhausted about nine years ago. The 1939 estimate of proven reserves is about 17 billion barrels and at the consumption rate of 1938 this would last only 14 years.

"Advanced methods of exploration, drilling, and recovery have been and are not only increasing the proven reserve but they are opening up almost unsuspected possibilities in future reserves not yet proven. In 1909 a deep well was 6000 feet, in 1929 it was 9000; in 1938, 15,000 feet. Not only is there an increase in the proportion of oil recovered from a given field, but new methods are being applied whereby old fields that were thought to be exhausted are again producing.

"In one Pennsylvania field, for example, water drive methods have demonstrated a reserve that is greater than all the oil taken out of that field in the past 70 years of working.

"If you must have an answer to the question 'How long?', perhaps 150 years is none too high."

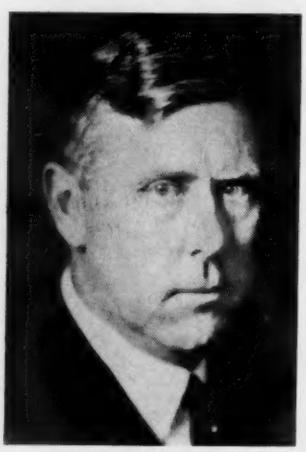
Attendance at the meeting approximated 1400. During the five-day period, 22 technical sessions and

H. H. Morgan
New president, American Society for Testing Materials

over 225 committee meetings were held. A notable feature was action on a large number of standards and tentative standards.

A review of progress through work of the many committees, introduction of new officers, and recognition of two individuals and two companies holding memberships in the society for 40 years, were other features of the opening session.

Individuals recognized with certificates for four-decade affiliations were: W. H. Broadhurst, chemist, bureau of highways, Brooklyn, N. Y.; and Frank G. Kennedy Jr., president, Logan Iron & Steel Co., Philadelphia. Companies cited for the same tenure of membership were: Robert W. Hunt Co., Chicago; and Lowe Bros. Co., Dayton, O.



G. E. F. Lundell
New vice president, American Society for Testing Materials

H. H. Morgan, manager, rail and track fastenings department, Hunt company, was introduced as the new president. During the past year, Mr. Morgan was vice president. G. E. F. Lundell, chief, chemistry division, national bureau of standards, Washington, is the new vice president for two years.

Newly elected members of the executive committee for two years are: J. J. Allen, chief chemist, mechanical rubber goods division, Firestone Tire & Rubber Co., Akron, O.; R. D. Bonney, assistant manager of manufacturing, Congoleum-Nairn Inc., Kearny, N. J.; T. S. Fuller, engineer of materials, Schenectady works laboratory, General Electric Co., Schenectady, N. Y.; J. L. McCloud, metallurgical chemist, Ford Motor Co., Dearborn, Mich.; and M. A. Swayze, director of research, Lone Star Cement Corp., Hudson, N. Y.

Continuing as a vice president of the society is W. M. Barr, chief chemist and metallurgical engineer, Union Pacific railroad, Omaha, Neb.

Continue on Executive Committee

Holding over on the executive committee are: H. J. Ball, professor of textile engineering, Lowell Textile institute, Lowell, Mass.; A. T. Goldbeck, engineering director, National Crushed Stone association, Washington; Dean Harvey, materials engineer, central material and process engineering department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.; J. J. Shuman, inspecting engineer, Jones & Laughlin Steel Corp.; Pittsburgh; J. R. Townsend, materials standards engineer, Bell Telephone Laboratories Inc., New York; Past President A. C. Fieldner, chief technologic branch, bureau of mines, Washington; Past President A. E. White, professor of metallurgical engineering and director, department of engineering research, University of Michigan, Ann Arbor, Mich.; and Retiring President T. G. Delbridge.

Membership of the society June 1 was 4199, according to the executive committee's report presented by C. L. Warwick, secretary-treasurer. This represents a gain of 43 in the year. Sustaining memberships increased from 12 to 24.

The society voted to take a letter ballot on a number of changes in its regulation. These revisions will accomplish several things, Mr. Warwick stated. Most important is a restatement of standardization procedure in clearer form, with respect

to standing committee and general procedure. It is expected also that changes will speed up, where desirable, specifications from tentative to standard.

Forty-third annual meeting of the society will be held in Atlantic City, June 24-28, 1940. Next regional meeting and spring group committee meeting will be in Detroit, March 4-8, 1940.

The fourteenth Edgar Marburg lecture on "Stress, Strain and Structural Damage," delivered by H. F. Moore, professor of engineering materials, University of Illinois, Urbana, Ill., was a high point of the meeting. Professor Moore pointed out that the metallurgist with microscope and X-ray diffraction apparatus has shown internal structure of materials is far more complicated than former simplified assumptions. Structure of materials seems so complicated that so far no mathematical analyst has proposed rigid formulas which fit all these new viewpoints.

Our formulas are "statistical," and our tests at best are guides with a high probability of usefulness in selecting materials. He discussed various types of structural damage, and the value of common test results as prophesies of resistance to structural damage.

Medal Awarded

R. W. Carlson, associate professor of civil engineering, Massachusetts Institute of Technology, Cambridge, Mass., was presented with the thirteenth award of the Charles B. Dudley medal for his paper on "Drying Shrinkage of Concrete as Affected by Many Factors," read at the 1938 annual meeting.

Report of committee E-9 on research reviewed the work of various committees which come under its observation, including the research committee on fatigue of metals; the joint research committee on effect of temperature on properties of metals of the American Society of Mechanical Engineers and A.S.T.M.; joint committee on exposure tests of plating on nonferrous metals, composed of representatives of the American Electro-Platers' society, national bureau of standards and A.S.T.M.; and effect of speed of testing on physical properties of metals.

New research activities undertaken during the past year include committee investigation on chilled and white iron castings; and painting of structural iron and steel.

This committee's report was presented by its chairman, T. S. Fuller, engineer of materials, works laboratory, General Electric Co., Schenectady, N. Y.

Reporting for committee E-10 on Standards, Cloyd M. Chapman, consulting engineer, its chairman, stated that reports of standing committees presented at the meeting included 62 new tentative standards, 50 revisions of existing tentative standards, 22 tentative revisions of existing standards, 116 tentative standards recommended for adoption as standard, 101 revisions of existing standards recommended for adoption as standard, and 57 standards and tentative standards withdrawn or replaced.

There are at present 505 standards and 365 tentative standards of the society, making a total of 870, and if the current recommendations are approved, this total will become 875.

Concurrent with the annual meeting, the society conducted its fifth exhibit of testing apparatus and related equipment, and the first in Atlantic City. Forty exhibits were sponsored by equipment companies, commercial research laboratories and universities, and A.S.T.M. committees.

A report of technical sessions begins on page 40, this issue.

Ford Demonstrates Tractor; New Farm Era? Mechanical Details

DETROIT

■ HAILING the new Ford tractor as the solution to the problem of making farming profitable as well as interesting, and suggesting the possibility that this new implement may be the means of putting an end to war in the world by making unnecessary the acquisition of more land by aggressor nations, Harry Ferguson, Irish inventor of the Ferguson system of implements used on the Ford tractor, addressed 460 representatives of the press from the United States and 18 foreign countries at Dearborn Inn, Dearborn, Mich., June 29.

Estimates indicate there are 16 to 17 million horses and mules now in use on American farms which furnish a livelihood to 6,800,000 families. To what a minor extent farm mechanization has progressed, he said, is indicated by the fact only 1 per cent of the farms in the entire world, which support 115,000,000 families, can be considered mechanized. With farming methods so hopelessly out of date, it is small wonder profits are evanescent, and with a basic industry such as farming in red ink, it is virtually impossible for any country to enjoy general prosperity.

"Bonuses and subsidies are not the way to remedy this situation," declared Mr. Ferguson, "for they only destroy self-reliance which is the real road to prosperity."

Sitting in the background and taking no part in the ceremonies were Messrs. Henry and Edsel Ford who have thrown the industrial might of the Ford Motor Co. behind pro-

■ **Operation of the new Ford light-weight farm tractor is said to be "simplicity itself," an eight-year-old boy experiencing no difficulty in making turns and lowering and raising implements into and out of the ground. Structural members throughout the power plant are of a new type of high-strength cast steel**

duction of this new light-weight tractor for the avowed purpose, not of making profit out of it, but "to help the country and the world by making agriculture easier and more profitable."

The tractor itself (STEEL, April 24) uses an entirely new principle in attaching implements, eliminating the need of excess weight to obtain penetration into the ground and to keep front wheels from lifting off the ground. Under this system, when the implements strike an obstruction, the front wheels are forced into the ground more firmly and the rear wheels are lifted from the ground and spun until the tractor is reversed and the obstruction cleared.

Another feature, capably brought out in demonstrations during the afternoon at the estate of Mr. Ford, is the hydraulic mechanism which is not only a hydraulic lift but a system of controlling automatically the implement to any desired depth, regardless of irregularities in the surface of the land. The tractor and unit implement are coupled so closely they can work in small irregular plots of land and corners too small even for horses. This was demonstrated by tilling completely a 20 by 27-foot enclosure.

Full Equipment Is Standard

Production of the new tractor is officially under way at the Ford Rouge plant now. Fifteen of the units were displayed at the demonstration tests, and regular deliveries will start soon, distribution and sales being under direction of the Ferguson-Sherman Mfg. Corp., Dearborn, Mich. List price is $585 delivered at Detroit, taxes extra. This is fully equipped with rubber tires, battery and generator, self-starter, governor, oil bath air cleaner, muffler, power takeoff, hydraulic controls for implements, streamlined radiator grille of sand cast aluminum, fenders, instrument board, ignition lock, throttle control and independent brakes on rear wheels.

A two-bottom Ferguson unit plow of 14-inch width is the first implement to be available and it will sell for $85 delivered at Detroit. Other implements to be produced include single-bottom plow, corn or rowcrop cultivator and a general purpose cultivator. The latter is of novel construction in that each tine is mounted against a spring and can override obstructions as it moves along, without danger of breakage.

Engine is a 4-cylinder L-head type with bore 3.18 inches and stroke 3.75 inches. Brake horsepower is 23 at 1400 revolutions per minute. A variable-speed governor, controlled from the steering column has a working

(*Please turn to Page* 71)

LABOR

GRANITE CITY EMPLOYES AGREE TO WAGE CUT

■ WAGE reductions of 2 to 5 per cent for about 1500 employes of Granite City Steel Co., Granite City, Ill., have been agreed to by the company and Amalgamated Association of Iron, Steel and Tin Workers, a CIO affiliate, effective July 1.

The arrangement was made because the company has been operating at a loss. No cut is to be made on employes receiving the minimum wage of 62½ cents per hour. Those receiving up to 79 cents per hour take a reduction of 2 per cent; from 80 to 90 cents, 3 per cent; and from 91 cents up, 5 per cent. This applies to employes working on new-type mills. Those on old-type mills will receive 10 to 12 per cent reductions.

BAR IRON WAGE RATE LOWER FOR JULY

Wages of puddlers and bar mill workmen for July have been reduced through operation of the bar wage scale of the Amalgamated Association of Iron, Steel and Tin Workers. Monthly examination of sales prices by representatives of the Amalgamated and Western Bar Iron association last week developed a 2.15c card rate for boiling, bar and 12-inch mills, compared with 2.20c in June; and 2.25c for guide and 10-inch mills, against 2.30c in June.

The new rate entitles puddlers to $12.55 a ton in July, 25 cents less than the $12.80 paid in June.

HEPPENSTALL SIGNS SWOC AGREEMENT

First union contract in the history of Heppenstall Co., Pittsburgh, has been signed with SWOC, according to company officials. The contract follows the usual outline for steel plants, including a 40-hour week, 62½-cent minimum wage, rules for hearing grievances and determining seniority rights.

The principal difference is provision for one week's vacation with pay for all employes of five years service or over. During the past few years, employes had been given choice of a week off or a week with double pay, and had chosen the latter. Recently a wage reduction eliminated this. The new contract restores vacations but does not permit extra pay if the time off is not taken.

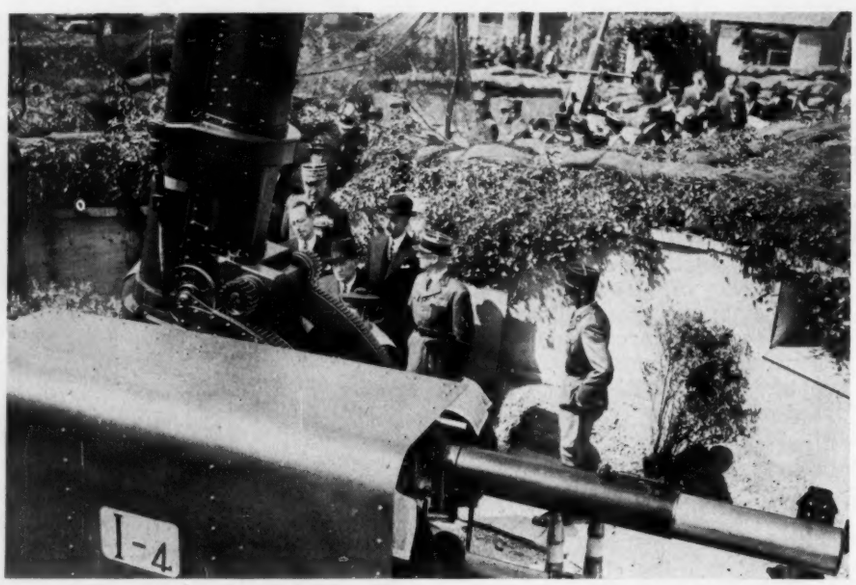
In 1937 the SWOC attempted to unionize the plants but employes opposed. Labor board litigation continued up to the signing of the contract, but petitions for a board election have now been withdrawn.

EMPLOYMENT DECLINED SLIGHTLY DURING MAY

During May 447,000 employes were on the steel industry's payrolls compared with 452,000 in April, and 436,000 in May, 1938, according to American Iron and Steel institute.

The industry's payrolls in May

"United We Stand" Objective, Without a War



■ **Bringing defense preparations to their very doors has proved a powerful influence in uniting people of France in a national objective, tending to heal political and social differences. Premier Edouard Daladier is shown inspecting an anti-aircraft machine gun in camouflaged emplacement opposite the Invalides in Paris. Under his administration France has regained much economic ground.**
NEA photo

amounted to $60,372,000; in April $58,517,000, and in May, 1938, $46,757,000.

Wage-earning employes earned an average of 83.5 cents an hour in May, against 82.9 cents an hour in April, and 83.6 cents in May 1938. The number of hours worked per week per wage earner averaged 32.7 in May; 32.1 in April, and 24.4 in May of last year.

STEEL "LARGEST EMPLOYER IN '37"

Steel was the largest industrial employer in 1937, according to the biennial census of manufactures. Eight industries employed an average of more than 200,000 persons per month during that year, as follows:

	Monthly average employes
Steel works, rolling mills	479,342
Cotton woven goods	336,104
Lumber and timber products	323,928
Auto parts and bodies	284,814
Electrical machinery, supplies	257,660
Bread, bakery products	239,388
Boots and shoes	215,438
Auto, motorcycle, bicycle	201,465

Iron Processing Corp. Organized at Canton

■ Canton Development Corp., Canton, O., has announced formation of the Iron Processing Corp. The latter will develop and use entirely new processes invented by T. F. Baily, Canton, for the making of iron and steel products. It will occupy factory property formerly owned by the American Forge & Machine Co., Cleveland avenue and Seventeenth street, S. W., Canton, and will shortly install equipment there.

Officers of Iron Processing Corp. are: John Quinn, president; H. E. Theiss, vice president, Kenneth B. Cope, secretary, H. E. Patrick, treasurer; T. F. Baily, general manager.

The new company expects to start operations about Aug. 1, and will employ a small operating personnel, until processes are fully developed.

Tin Output Lower but Consumption Rises

■ World tin production in April amounted to 11,200 gross tons, 3300 tons less than 14,500 tons in April, 1938. Four months' output this year was 44,700 tons, compared with 57,800 tons last year.

World apparent tin consumption was 14,300 tons in April this year; 12,100 in April, 1938. For four months aggregate this year was 50,100 tons, 3000 tons below 53,100 tons in the same period, 1938, according to the International Tin Research and Development council.

District Steel Rates

Percentage of Ingot Capacity Engaged In Leading Districts

	Week ended July 1	Change	Same week 1938	Same week 1937
Pittsburgh	47	None	23	80
Chicago	51	+ 1.5	27	63.5
Eastern Pa.	38	None	27	66
Youngstown	51	— 3	28	75
Wheeling	79	None	38	92
Cleveland	51	— 4.5	23	49
Buffalo	35	— 4.5	28	87
Birmingham	71	None	42	83
New England	32	None	23	92
Cincinnati	65	+ 5	28	93
St. Louis	42	None	33.3	93
Detroit	57	None	29	100
Average	54	— 0.5	28	77.5

New Equipment for Tight-Coat Galvanized Sheets

■ Wean Engineering Co. Inc., Warren, O., has introduced a new type of galvanizing equipment "for production of exceptionally tight-coat galvanized sheets used for deep drawing and forming operations."

The company's announcement says: "It results in lower dross formation in the pot, and a clean sheet is produced. The combination of these two advantages, with a method of controlling the coating, produce galvanized sheets at lower cost."

Company has just installed four complete galvanizing units at Wheeling Steel Corp.'s Steubenville works, and two heavy duty double bottom roll units at the Richard Thomas plant, Ebbw Vale, Wales, for coating of heavy gage sheets. Steel Corp. of Bengal, also is installing four units in its new plant in India. A unit is being built for Tata Iron & Steel Co. Ltd., Jamshedpur, India, this to make the third galvanizing unit installed by Wean in the Tata plant within the last few years.

United To Build Mill Equipment for Japanese

■ Steel mill equipment costing several million dollars has been ordered from United Engineering & Foundry Co. by two Japanese steelworks.

To Nippon-Seitetsu Kaisha Steel Co., Hirohata, will go an 86-inch semicontinuous plate mill, and to Sumitomo Metal Industries Ltd., Osaka, a sheet rolling mill. Comprising slab heating furnaces, a universal reversing breakdown mill and four stands of 4-high continuous finishing mills, the plate mill will have 1,000,000-ton annual capacity, produce plates up to 2 inches thick.

Plate mill is to be delivered within a year, the sheet mill in six months.

PRODUCTION

■ STEELWORKS operations last week declined half a point to 54 per cent. Increases were noted in two districts and declines in three; seven were unchanged. Last year the rate was 28 per cent; two years ago 77.5 per cent.

Youngstown, O.—Down 3 points to 51 per cent, two bessemers and 46 open hearths active. Holiday shutdowns this week will cut deeply into production but schedules for the following week indicate rebound to about 54 per cent with resumption by Youngstown Sheet & Tube Co.'s bessemer. A blast furnace will be blown in this week at Lowellville, O., and another at Sharpsville, O.

Chicago—Advanced 1.5 points to 51 per cent on improved schedules by several producers.

Buffalo—Reduced 4.5 points to 35 per cent as Bethlehem Steel Co. shut down two open hearths.

Cleveland—Curtailment by two mills reduced the rate 4.5 points to 51 per cent. A further decline is indicated this week.

St. Louis—Continued at 42 per cent for the third week.

Cincinnati—Increased 5 points to 65 per cent. The July rate will be lower as American Rolling Mill Co. plans to shut down its Middletown furnaces while installing a new blooming mill.

New England—Unchanged at 32 per cent, one works being idle and others operating at reduced rate.

Pittsburgh—Steady at 47 per cent with prospects for much lower rate this week from holiday idleness.

Wheeling—Held at 79 per cent, with some recession expected this week.

Detroit—Remained at 57 per cent, though there will be holiday interruptions this week.

Central eastern seaboard—Steady at 38 per cent.

Birmingham, Ala.—At 71 per cent production showed no change.

Canada's Steel, Iron Production Up in May

■ Steel ingot production in Canada in May was markedly higher than in April and exceeded that of May, 1938. Pig iron and ferroalloy output was larger than in April but below that of May, 1938. Comparisons in gross tons are as follows:

	Steel ingots	Pig iron	Ferroalloys
May, 1939	121,413	57,746	4,925
April, 1939	99,752	46,254	4,284
May, 1938	114,859	71,602	6,441
5 mos., 1939	472,239	243,716	20,889
5 mos., 1938	561,340	339,783	29,091

MEN OF INDUSTRY

■ O. F. METZ, former branch manager of the El Paso, Tex., district office of Allis-Chalmers Mfg. Co., Milwaukee, has been made district manager of the combined El Paso and Phoenix, Ariz., district offices, with headquarters at El Paso. This consolidation was brought about by the retirement of J. B. Cooper, manager of the Phoenix branch, after more than 30 years of service with the company. H. H. Roth, of Phoenix, has been transferred to El Paso. Henry W. Erickson, recently transferred from Allis-Chalmers' crushing, cement and mining division at

O. F. Metz

Milwaukee, will remain in the combined El Paso territory as a representative specializing in mining machinery.

♦

John M. Scheide has resigned as a director, Universal-Cyclops Steel Corp., Bridgeville, Pa.

♦

W. C. Buell Jr. and H. R. Moorhouse, Arthur G. McKee & Co., Cleveland, sailed June 30 for a business trip in Europe.

♦

W. W. Coleman, president, Bucyrus-Erie Co., South Milwaukee, Wis., has returned from a two-month trip to England and France.

♦

John E. James, chairman, Lancashire Steel Corp. Ltd., has been nominated an honorary vice president, (British) Iron and Steel institute, London.

♦

William H. Frank has been elected president, Bulldog Electric Products Co., Detroit. M. C. Emery, has been named executive vice president; J. J. Mitchell, vice president in charge of sales; A. J. Lennerts, vice president in charge of manufacturing; William H. Frank, secretary, and M. C. Emery, treasurer.

♦

Ralph S. Euler, first vice president, Union Trust Co. of Pittsburgh, has been elected a director, Standard Steel Spring Co., Coraopolis, Pa., increasing the board to nine members.

♦

Charles R. Ogsbury has been elected vice president, International Business Machines Corp., New York. He has been associated with the organization 29 years.

♦

W. H. Stewart, formerly Great Lakes district manager, Davey Compressor Co., Kent, O., has been appointed assistant general sales manager.

♦

J. C. Coutant has been named vice president, Controlled Steam Generators Inc., New York. He formerly was a refractory and fuel engineering consultant.

♦

Rolland C. Allen, executive vice president, Oglebay, Norton & Co., Cleveland, has been awarded the honorary degree of doctor of engineering by Rensselaer Polytechnic institute, Troy, N. Y.

♦

William H. Harman, vice president in charge of sales, and William H. Winterrowd, vice president in charge of operations, Baldwin Locomotive Works, Philadelphia, have been elected directors.

♦

O. E. Ostrom, the past 12 years with Carnegie-Illinois Steel Corp.'s St. Louis district sales office, has joined Steel Sales Corp.'s St. Louis branch as sales representative for Missouri, Arkansas and southern Illinois.

♦

Dr. Steven P. Timoshenko, professor of mechanics, Stanford university, has been presented with the Lamme medal for 1938 by the Society for the Promotion of Engineering Education "for devotion to art of teaching."

♦

Louis M. Hague has been elected vice president in charge of sales, Hanson-Van Winkle-Munning Co., Matawan, N. J. C. W. Yerger, formerly vice president and sales manager, has been appointed executive vice president.

♦

W. W. Noble, for many years Detroit district sales manager, Pittsburgh Crucible Steel Co., has been transferred to the Cleveland office as district sales manager, succeeding the late K. E. Porter. William G. Hassel, the past three and one-half years sales engineer for Pittsburgh Crucible Steel, has been appointed district manager at Detroit, replacing Mr. Noble.

♦

Walter J. Borst, formerly superintendent of the Harvester works, Deere & Co., Moline, Ill., has joined the Oliver Farm Equipment Co., Chicago, as manager of its Nichols and Shepard division plant at Battle Creek, Mich.

♦

Richard P. Brown, chairman of the board, Brown Instrument Co., Philadelphia, and vice president,

Richard P. Brown

Minneapolis-Honeywell Regulator Co., Minneapolis, was recently appointed by Gov. Arthur H. James of Pennsylvania to be the first secretary of the new Pennsylvania department of commerce.

♦

Harry C. Morrison, 430 Penton building, Cleveland, has been appointed exclusive representative in the Cleveland district for Union Metal Mfg. Co., Canton, O., manufacturer of corrugated steel skid platforms, box tops and corrugated box trucks.

♦

Leonard E. Nichols, heretofore chief welding engineer, National Electric Welding Machine Co., Bay City, Mich., has become technical advisor and sales engineer for the Detroit district sales division, with offices in the General Motors buildings.

♦

Heartly W. Anderson has been appointed sales representative, Crobalt Inc., Detroit, maker of nonferrous cutting tools and wear plates. He is a graduate of Notre Dame university in civil engineering, and was well known for ac-

complishments in intercollegiate football.

♦

C. C. Conner, assistant advertising manager, Aluminum Co. of America, Pittsburgh, has been elected president, Pittsburgh Advertising club. Fred W. Pennington, Westinghouse Air Brake Co., Pittsburgh, has been elected vice president.

♦

Thomas V. Brooke, a graduate of Virginia Military institute, and for several years associated with Lincoln Electric Co., Cleveland, as a research engineer, has been appointed sales engineer, Lincoln Electric Railway Sales Co., with headquarters at 310 South Michigan avenue, Chicago.

♦

B. M. Horter, heretofore in charge of the resale sales division, Cutler-Hammer Inc., Milwaukee, has been appointed general sales manager. He joined Cutler-Hammer as a sales engineer in the Philadelphia territory. In 1921 he opened a new sales territory for the company in Wilkes Barre, Pa., after which he was appointed manager, New England district. In 1934 he was named manager of resale sales. Mr. Horter is a member, National Electrical Manufacturers association.

♦

Edwin J. Mohr, manager of plant operations, Symington-Gould Corp., Rochester, N. Y., and Gould Coupler Corp., Depew, N. Y., has retired after nearly 30 years with Symington-Gould Corp., its subsidiary and predecessor companies. The former assistant managers of plant operations, W. H. Hartwig at Rochester, and D. P. Murphy at Depew, have been appointed production managers for the two plants, respectively.

♦

Frank W. Klatt has returned to the W. W. Sly Mfg. Co., Cleveland, as general manager, a position he occupied from 1920 to 1927. In the intervening period he had been engaged in an executive capacity with one of the large automotive industries, principally in foreign countries. More recently Mr. Klatt spent six years in India.

♦

Preston L. Plews, formerly with Henry Vogt Machine Co., and Vilter Mfg. Corp., has been appointed New York district manager, with offices at 159 East Thirty-fourth street, for D. W. Haering & Co., Chicago, scale and corrosion control consultants. Neville Row has been promoted to district manager in charge of the Minneapolis office, Plymouth building; R. E. Turner has been placed in charge of the new Philadelphia office at 2018 Sansom street; J. B. Schroeder is in charge of the tri-city area offices at 3748 Drake avenue, Cincinnati; Hiram C. Daggett in charge of the office opened at 715 Brisbane building, Buffalo; W. B. White, previously sales metallurgist, Carnegie-Illinois Steel Corp., will be in charge at Cleveland, headquarters 13910 Woodworth road. Co-operating with Mr. White, W. M. Acker Organization Inc., has been appointed distributor for Ohio and Michigan territories.

B. M. Horter

♦

Frank S. O'Neil has been appointed general manager of Link-Belt Co.'s Indianapolis plants, of which he had been assistant general manager the past seven years. Mr. O'Neil has been associated with Link-Belt 33 years, 23 in Indianapolis where he successively served as assistant superintendent in charge of malleable iron chain assembly, superintendent of the Ewart plant, and assistant general manager of both Ewart and Dodge plants.

♦

Harold M. Moock, Moock Electric Supply Co., Canton, O., was elected president, Westinghouse Agent-Jobbers' association, at its recent meeting in Hot Springs, Va. Other officers are: Vice president, Ralph Kelly, vice president, Westinghouse Electric & Mfg. Co., Pittsburgh; secretary, Claude W. Johnson, Johnson Electric Supply Co., Cincinnati; treasurer and assistant secretary, L. B. Bourns, merchandising division, Westinghouse Electric & Mfg. Co., Mansfield, O.; counsel, J. J. Jackson.

DIED:

■ WALLACE FORREST MacGREGOR, 65, chief engineer and a director, J. I. Case Co., Racine, Wis., and a leading farm implement engineer, in that city, June 19. He joined the company following graduation from University of Wisconsin Engineering college where he received his degree in mechanical engineering in 1897, and a year later his master's degree. At one time he was president, American Society of Agricultural Engineers, and also was active in the American Society of Mechanical Engineers.

♦

Edward William Newman, 51 for 21 years secretary-treasurer, Cleveland Aluminum Castings Co., Cleveland, in that city, June 23.

♦

George F. Steele, 76, electrical engineer, Brookline, N. Y., who was associated with General Electric Co. from 1892 until his retirement in 1931, in Brookline, June 25.

♦

George P. Gardner, 83, who until his resignation in October, 1938, had served on the board of General Electric Co., Schenectady, N. Y., 43 years, at his home in Bourne, Mass., June 6.

♦

John E. McAllister, 55, former mechanical engineer, Electric Controller & Mfg. Co., and the C. L. Bryant Corp., Cleveland, heater and furnace manufacturer, June 8 in that city.

♦

John Jackson, president, Simonds Gear & Mfg. Co., Pittsburgh, in that city, June 24. Prior to being elected president in January, 1936, Mr. Jackson served as vice president and a director since the company's formation in 1892.

♦

James MacIntosh, 51, superintendent of the iron foundry, Sacks Barlow Foundries Inc., Newark, N. J., in that city, June 4. He had been associated with the foundry industry more than 35 years, 20 of which were spent with the Sacks organization.

♦

W. T. Christian, superintendent, Ironton Fire Brick Co., Ironton, O., in Ironton, June 16. Mr. Christian was identified with the fire brick industry during his entire business career, and was with the Ironton company since 1927.

♦

William J. Abele, 73, prominent in Birmingham, Ala., industrial circles, June 12 in that city. He went to Birmingham in 1905 as superintendent, Southern Steel Co., remained with its successors, and later was employed by Tennessee Coal, Iron & Railroad Co. until his retirement three years ago.

♦

O. R. Jones, 75, retired electrical engineer, Sharon Steel Corp., in Youngstown, O., June 18. He spent 12 years with Youngstown Sheet & Tube Co., prior to joining the Sharon organization where he was employed 24 years. He retired three years ago. Mr. Jones was past president, Association of Iron and Steel Engineers.

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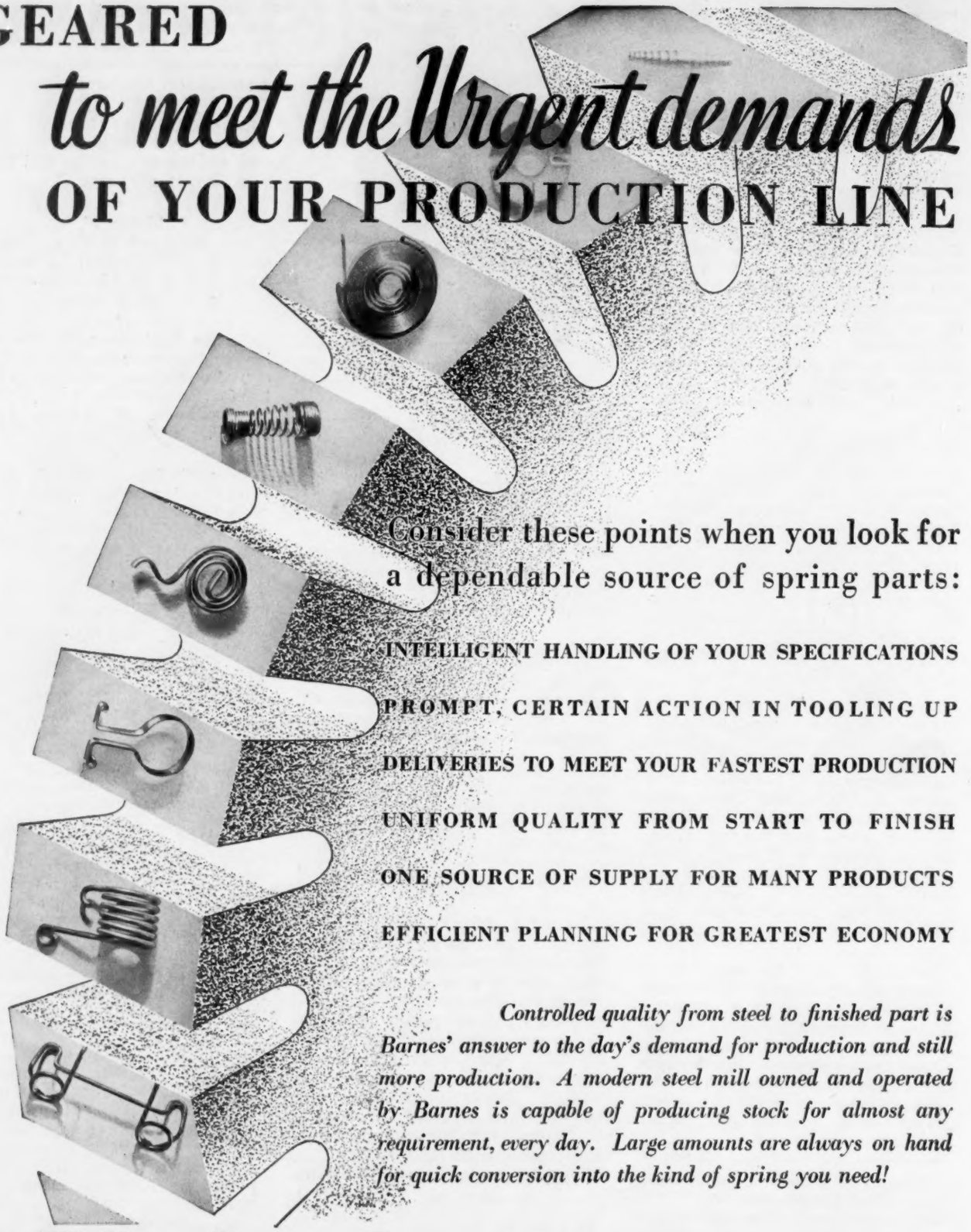

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Windows of WASHINGTON

By L. M. LAMM
Washington Editor, STEEL

WASHINGTON

■ HEARINGS before the senate labor committee on proposed amendments to the national labor relations act are dragging so interminably it is considered impossible for congress to push through any revisions this session, despite the widespread demand for such action.

B. C. Heacock, president, Caterpillar Tractor Co., and chairman of the committee on manufacture, United States chamber of commerce; and John W. O'Leary, chairman of chamber's executive committee, last week appeared before the senate group with proposals for specific amendments.

Mr. Heacock called for changes to make the law specify aggregate rules governing the administration of evidence, and making for fairness and impartiality in the conduct of hearings and affording uniformity in such hearings the country over. He asserted examiners for the board show extreme partisanship.

"It is submitted that the basis for court review of findings of fact should be as broad in the labor relations act as in the sugar act and the food, drug, and cosmetics laws. The labor relations board follows the practice of setting out detailed findings of fact. This should be made a statutory requirement. There should be added, we believe, a requirement that these findings be supported by substantial evidence of a kind that would be valid in a court of equity," Mr. Heacock stated.

Seeks Right To Appeal

"The act is now completely lacking in provision for judicial review of the board's decisions in connection with elections to determine representatives. This omission we believe should be remedied.

"The right of appeal for a judicial review should be granted to all parties to an election controversy, including labor organizations to which the board refuses recognition, and an employer whose petition for determination of the representative with whom he is to deal is denied."

Mr. O'Leary called attention to the number of strikes since the act was passed, said there is much reason to believe that with any substantial increase in business activity there will be another tide of industrial disturbance.

He cited a statement of the board which said that "insofar as industrial strife is concerned, 1938 reported not only a tremendous improvement over 1937, but also the best record in recent years."

Strike Record Disputed

"The published records of the labor department," said Mr. O'Leary, "do not bear out that statement. In the first place, it must be recognized that strikes and labor disturbances in the early part of 1937 reached a peak both in number and in extent. There had previously been a heavy increase caused by the provisions of section 7 (a) of the national industrial recovery act of 1933, and the gain had continued under the labor relations act.

"Provisions of section 7(a) caused strikes to double in 1933, and the number of persons involved to treble, over the figures for the preceding year. Both came to a peak in the first half of 1937. Although the number of strikes fell off in the second half of that year, the total for the entire year was the highest for any year in our history —4740. To be sure, the number of workers involved—the published figure being 1,860,000—was exceeded in 1919 by the 4,160,000 persons involved in 3630 strikes. But it will be recalled that 1919 was a year beset by many post-war maladjustments."

William J. Cronin, Detroit, secretary of the manufacturers committee, Automobile Manufacturers' association, also appeared, suggested improvements in the act to end weaknesses which its application up to this time has revealed. He pointed to conditions demanding change.

Outlining the importance of the automotive industry as a source of employment, and describing the long era of labor peace it enjoyed prior to NRA, Mr. Cronin listed the innumerable disturbances marking the period covered by application of the national labor relations act. Violence and coercion have been brought to bear on employes by auto union groups, with the present factional split in union ranks continuing to threaten normal employment and production.

He declared the objectives which constitute the declared purposes of the act—industrial peace through genuine collective bargaining by employes and their freely-selected representatives—can only be accomplished by a three-way amendment:

1. To insure the worker real freedom of choice to select or reject bargaining representatives without coercion or intimidation by anyone.
2. To insure observance of agreements by all parties thereto, subject to equal penalties for violation.
3. To guarantee that strikes and other stoppages of production, with their consequent hardship to employes and losses to the consumer and the state, as well as to industry, shall represent the will of a majority of the employes and not the ill-considered action of a few leaders or a small portion of employes.

"Industrial peace," he concluded, "will certainly be remote so long as minorities or leaders, for their own purposes may call strikes without penalty or loss of status regardless of contract provisions or the wishes of a majority of workers."

HOPKINS GETS $160,000 FOR BUSINESS ADVISORS

President Roosevelt last week signed the commerce department's appropriation bill for the new fiscal year.

Included is an appropriation for services of business "experts and specialists." Mr. Hopkins had asked congress for $225,000 for an unnamed number of business experts,

but as the bill was finally passed by congress and signed by the President, the appropriation was cut to $160,000.

The secretary wanted carte blanche to appoint such experts without regard to civil service or Presidential appointments. Congress did not see it that way and provided that no salaries shall exceed $9000 a year and that any person receiving $7500 or more will have to be appointed by the President and approved by the senate.

HEARINGS ON CONSTRUCTION INDUSTRY OPENED BY TNEC

Temporary national economic committee last week opened hearings on the construction industry, their conclusion being expected shortly.

In these hearings the committee is attempting to determine the obstacles to residential construction and the methods necessary to stimulate it.

Dr. Isador Lubin, labor department's commissioner of labor statistics, told the committee the housing industry is building homes too high-priced for the great majority of prospective buyers.

Lubin presented charts showing 85 per cent of the houses built in 1938 were priced beyond the reach of more than half the urban population. Experts contrasted this with the automobile industry, a conspicuous example of an industry which has priced its commodity to its market.

The number of workers employed in the construction industry, Lubin said, has dropped from an average of 1,800,000 in the 1920's to 1,200,000 in the present decade.

Houses selling for between $2000 and $4000, he asserted, are necessary to put homes within the reach of half the urban population. The number of houses built in 1938 in the $6000 to $10,000 price range, he declared, is far out of line. To maintain housing standards at existing levels, it was estimated, the industry will have to build 200,000 more houses annually than it did last year, giving direct and indirect employment to 500,000 men.

INCREASE IN SPONSORS' FUNDS FOR WPA PROJECTS

Sponsors' funds used on WPA projects during the fiscal year 1939 amounted to approximately $489,000,000, according to Col. F. C. Harrington, WPA administrator. This represents a 65 per cent increase over the $297,000,000 so contributed during the fiscal year 1937, and a 32 per cent increase over $370,000,000 during the fiscal year 1938.

During 1939 approximately 85 per cent of sponsors' expenditures represented materials, equipment and other nonlabor items necessary to the operation of projects. The remaining 15 per cent represented wages paid to supervisory employes and skilled labor which could not be obtained from local relief rolls.

RETIRING CHIEF REPORTS ON STATE OF DEFENSES

Retiring as army chief of staff, Gen. Malin Craig made his annual report to the secretary of war last week instead of holding it over until congress' next session in January.

He went into detail on the strength of the regular army, the reserve corps, equipment, airplane procurement, mechanization and other subjects.

Discussing airplane procurement Gen. Craig said, "An operating air force nearly double that of the Baker board objective, plus reasonable reserves, is being provided, assuring an adequate 'M-day' air force for our national defense. Progress has been made toward the acquisition of types of aircraft the equal of any in the world as to design, speed, endurance and suitability for the military use intended. Future appropriations will be required to bring the air corps program into complete balance as to housing and maintenance and provide annual replacements."

CONFUSION ON STRATEGIC MATERIALS ACT PROVISIONS

Considerable misunderstanding prevails concerning the strategic materials law, as to what purchases shall be made and the procedure.

Section 5 provides purchases under the measure shall be made in accordance with a previous act of congress establishing the "buy-American" principle. Purchases must be made under competitive bids. Apparently the story is going around that purchases can be made without the government asking for bids, but this is not the fact.

There is also much speculation as to what commodities will be purchased when and if the necessary appropriation is effected. There is little question that these will include manganese, tungsten and chromium. It is not known whether tin will be one of the commodities. It had been expected tin would be acquired through a barter plan with Holland, but according to unofficial reports the negotiations fell through. All strategic materials are to be purchased through the treasury department's procurement division.

COMMERCE DEPARTMENT TO AID BUSINESSMEN AT FAIR

Department of commerce announced last week it will station a representative at its headquarters in the "world trade center" at the New York World's fair to consult with American and foreign business men on various trade problems. Harry Chalmers, chief of the division of foreign tariffs, is the first to serve.

Chief duty will be to direct business men to the proper officials in the commerce department at Washington, and to other sources of information, for aid in solving problems. Foreign visitors will be acquainted with American business activities.

BRAZIL SEEKING TO ESTABLISH STEEL PLANT

While it has long been the desire of the Brazilian government to set up a blast furnace and steel plant based on using Minas Geraes (Itabira) iron ores, and numerous proposals have been advanced, the accomplishment of such a program does not appear especially imminent at this time.

At the moment the most actively pushed plan is that of a Dr. Raul Ribeiro which contemplates exporting iron ore essentially in exchange for coking coal, extra iron ore to be exported to pay for increased productive, shipping, and loading facilities, and erection of a blast furnace and complete steel plant in Rio de Janeiro harbor, where it would be convenient to the coal to be imported and to tap the flow of iron ore moving from the interior to the proposed export loading dock.

The problem is to persuade someone to advance the considerable sum necessary to provide the mining and transportation facilities proposed in anticipation of receiving iron ore, possibly even to advance the funds necessary to erect the proposed plant. Ribeiro is in this country at this time endeavoring to arrange for the sale of ore.

GOVERNMENT IRON, STEEL AWARDS TOTAL $686,372

During the week ended June 24 the government purchased $686,372.44 worth of iron and steel products under the Walsh-Healey act as follows: National Tube Co., Washington, $59,580.60; Kinnear Mfg. Co. Inc., New York, $14,976; U. S. Pipe & Foundry Co., Philadelphia, $16,643.28; John Simmons Co., New York, $17,426.09; Columbia Steel Co., San Francisco, $10,205.11; American Bridge Co., Washington, $48,921.75; American Bridge Co., Pittsburgh, $375,444.11 (estimated); Remington Arms Co. Inc., Bridgeport, Conn., $12,750; Utica Drop Forge & Tool Corp., Yorkville, N. Y., $20,700; Macwhyte Co., Kenosha, Wis., $13,909.40; John A. Roebling's Sons Co., Trenton, N. J., $18,742.10; B. F. Goodrich Co., Akron, O., $14,980; Van Dorn Iron Works Co., Cleveland, $13,200; Western Pipe & Steel Co. of California, Los Angeles, $14,881; and Biggs Boiler Works Co., Akron, O., $34,013.

AVIATION

AIR CORPS TO OPEN BIDS FOR 2467 NEW PLANES

■ ACCELERATING its expansion program, army air corps this week will open manufacturers' bids for 2467 military airplanes of ten types, amounting to approximately $105,000,000.

Funds available for purchasing army aircraft during the fiscal year 1940 are expected to total $131,575,620. To attain the scheduled goal of 5500 planes by June 30, 1941, builders must deliver in the next two years 3500 units. Replacements will swell this quota.

Contracts last week went to Beech Aircraft Corp., Wichita, Kans., personnel transport ships, $450,000; and Vultee Aircraft division of Aviation Mfg. Corp., Downey, Calif., all-metal combat craft, $90,000.

War department last week placed contracts for airplane engines exceeding $25,000,000. Orders were booked by Allison Engineering division of General Motors, Indianapolis, $15,080,262; Wright Aeronautical Corp., Paterson, N. J., $8,975,317; and Pratt & Whitney division of United Aircraft, East Hartford, Conn., $953,810.

Aeronautical equipment allotments: For the army, Curtiss Propeller division of Curtiss-Wright Corp., Clifton, N. J., propeller assemblies and governors, $1,423,320; Pittsburgh Screw & Bolt Corp., Pittsburgh, propeller parts, $714,420; General Electric Co., Schenectady, N. Y., dynameters, $98,600; Hamilton Standard Propellers division of United Aircraft, East Hartford, Conn., propeller parts, $33,558; and Scintilla Magneto division of Bendix Aviation Corp., Sidney, N. Y., magneto assemblies, $30,373; and for the navy, Consolidated Aircraft Corp., San Diego, anti-icing equipment, $175,386.

Facilities at Duncan field, Texas, are to be expanded by the war department as follows: Fireproof shops and engineering building, $690,000; steel test stands for engines, $305,000; and enlarged equipment repair and inspection building, $205,000.

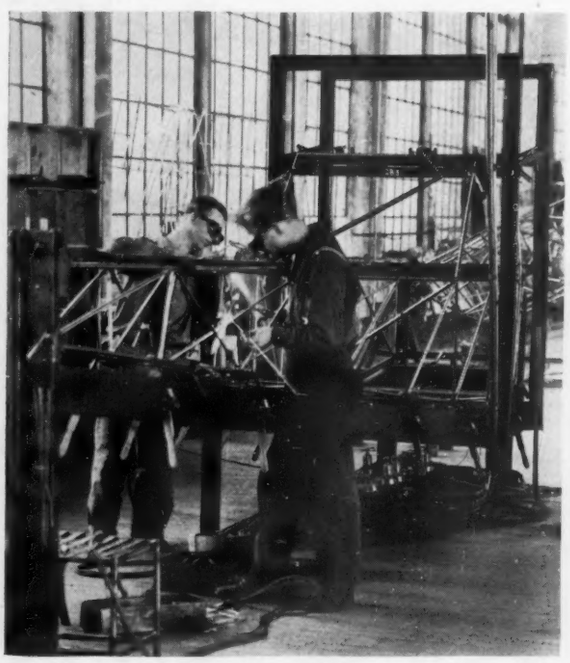
Vega division of Lockheed Aircraft Corp., Burbank, Calif., recently broke ground for a one-story assembly addition to its plant. Cost is estimated at $70,000 with equipment.

Canadian Plants Underway

Construction of new assembly plants at Malton, Ont., and St. Hubert, Que., for Canadian Associated Aircraft Ltd. got under way last week with placing of structural steel awards. Contracts went to Dominion Bridge Co. Ltd. and Standard Steel Construction Co. Ltd.

Rolls-Royce Ltd., Derby, England, soon will erect at Glasgow, Scotland, a $20,000,000 factory to produce airplane engines for Britain's air force.

Structural and power failures cause 32 per cent of accidents to aircraft in carrier service, it is indicated by civil aeronautics authority after surveying 911 mishaps between 1928 and 1937. Other factors in these accidents: Weather, landing conditions and other miscellaneous, 38 per cent; pilot errors, 21 per cent; other personnel errors, 4 per cent; handling qualities, 2 per cent; and undetermined, 3 per cent.



Welding Steel For Fuselage

■ **Fuselage assemblies of steel tube are all-welded at Piper Aircraft Corp.'s Lock Haven, Pa., plant. Building the "Cub" lightplane, Piper uses steel in fuselage, tail and landing gear, aluminum alloys in wings. Accounting for 30 per cent of commercial craft output in the past four years, company now turns out a "Cub" every two hours**

Activities of Steel Users, Makers

■ GENERAL Electric Co., Schenectady, N. Y., has purchased equipment and facilities of General Laminated Products Inc., New York, which for the past six years has been distributor and fabricator of G-E textolite laminated materials. Under the arrangement General Electric's Meriden, Conn., plastics plant will assume those services. General Laminated Products Inc. of Illinois will continue as fabricator and distributor of textolite laminated materials in the Middle West.

♦

Dreses Machine Tool Co., Cincinnati, has changed its name to Cincinnati Gilbert Machine Tool Co.

♦

Production Machine Co., Greenfield, Mass., has purchased Francis Reed Co., Worcester, Mass., manufacturer of drilling machines.

♦

T. B. Wood's Sons Co., Philadelphia, has appointed the Arnold Electric Co., Arlington, Va., distributor for its V-belts and V-belt sheaves.

♦

Detroit sales branch of United States Rubber Co., New York, and of United States Tire Dealers Corp., has been moved from its former location on East Jefferson avenue to 5850 Cass avenue.

♦

American Engineering Co., Philadelphia, maker of monorail electric hoists, has appointed the A. C. Cooper Sales Co., New York, its sales representative in metropolitan New York, Long Island and northern New Jersey.

♦

Reliance Steel Products Co., McKeesport, Pa., has received contract for furnishing 800 tons of I-beam interlock bridge flooring for the Ak-sar-ben bridge over the Missouri river between Omaha, Nebr., and Council Bluffs, Iowa.

♦

Lobdell Car Wheel Co., Wilmington, Del., has purchased the business of Nazel Engineering & Machine Works, Philadelphia. Howard W. Wimer, associated with the Nazel organization 35 years, will be in charge of the Nazel hammer and dill slotter division.

♦

Ward Leonard Electric Co., Mt. Vernon, N. Y., has moved its Philadelphia office to 1600 Arch street, with Frank Beede, formerly of the Chicago office, in charge. William Miller Tompkins and Lester B. Free, former Ward Leonard representatives at Philadelphia, have joined the organization.

WHICH ROAD?

Turn the Mult-Au-Matic Way

Do you know about the "J-7" and "J-11"— those small, fast machines which apply the proven Mult-Au-Matic method of independent feeds, independent speeds, and simultaneous operation to the manufacture of small parts?

Do you realize that set-up on Mult-Au-Matics is so easily changed that assorted runs of less than 200 pieces can be handled at lower cost on Mult-Au-Matics than by any other method? (We run lots of 60 pieces in our own plant economically).

Invariably the first Mult-Au-Matic makes a excellent reputation, and its performance sell successive machines. Perhaps a study woul show you savings and help speed your cours on the Road to Progress. It will cost yo nothing to consult a Bullard Engineer.

THE BULLARD COMPAN

July 3, 1939

This machine is a "J-7" Mult-Au-Matic —8 stations—with independent speeds and feeds at every station, for turning, boring, facing, drilling, reaming, and threading.

Handles parts up to 8" in diameter and 10" high. Send for bulletin giving complete information.

BULLARD **THE BULLARD COMPANY**

BRIDGEPORT, CONNECTICUT

Mirrors of MOTORDOM

By A. H. ALLEN
Detroit Editor, STEEL

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DETROIT

□ UNOFFICIALLY the 1940 production season has been launched, if only in a small way. At the end of last week, Packard had assembled about 200 sixes and eights, and schedules called for the completion of another 600 by July 12. This represents probably the earliest start ever made on new models in the history of the industry. Depending upon whether sufficient materials can be shipped, Packard plans to complete 5000 jobs in July.

Fragmentary reports on the new Packard lines suggest that exteriors are not changed appreciably, but that some changes are in store for rear springing design, and a new type of transmission may be offered as optional equipment. Preview of the 1940 models for the press is understood to have been set for Aug. 9.

Buick in Changeover

It is likely a start also has been made on the two new Buick lines, tentatively identified as the 50 and the 70 models, which should be on display at both World's fairs within the next few weeks. Body lines, as previously reported here, will be quite rakish and border on the styling of the Lincoln Zephyr. Whether the name Torpedo still is to be used for these models is not known definitely. Recent comment in the trade is to the effect there may be a possibility of some sort of joint promotion of these new models on the part of Buick, Olds and Pontiac. While the old B-O-P sales organization has been dismantled, a close association still exists between these three makes, with many parts such as bodies, axles and transmissions being practically interchangeable between the Buick 40 series and the Pontiac and Olds 8-cylinder models.

From information supplied to vendors, it is indicated Ford assembly lines will close for model changeover on Aug. 18, with the motor lines closing two weeks before that. Resumption on 1940 models will be made after Labor day, or Sept. 5. Thus, seven weeks more of production are in store for 1939 models at the Rouge plant, and last week the final budget, No. 10, was released covering the balance of assemblies contemplated. This would mean about 100,000 more on the current run.

Sales of the standard model Ford are reported to be improving in their ratio to deluxe models and it is assumed this strength will be reflected in decision to continue the smaller model next year, probably moving the body up to the lines of the present deluxe model. In fact, the entire Ford line may be moved up one notch as an ingenious means of offering the buyer more for his money, conserving on die costs, and at the same time not obsoleting the appearance of a model after a year's run. Such an arrangement would mean the present deluxe series would graduate to the Mercury class, the latter to the Zephyr category, and a new body design evolved for the Zephyr.

More Die Castings for 1940

Ford is still in production on pressed steel cylinder liners, formed from disks of fender steel and then given a cyanide-nitride heat treatment before installation. An interesting innovation is that the steel disks are completely copper plated before fabrication, apparently to provide better drawing qualities and to avoid scaling during the annealing which must be carried out between the two stages of drawing.

At this stage, it appears one striking feature of 1940 models will be the sharp increase in the use of die castings. Suppliers have been flooded with inquiries for new die cast parts, ranging from headlamp bezels and tail light cases to the customary handles, regulators and ornaments. One new application is a windshield center dividing strip which will appear on all Chrysler division lines next year. This zinc die casting is made in two pieces, an inner and an outer strip, bolted together with rubber between to hold the glass. Some will be chrome plated and some will be painted or grained. General Motors lines also incorporate such a dividing strip, but it is usually chrome plated steel, although next year a switch to stainless steel may be made.

Promoting New Seat Spring

Efforts are being made to promote a new type of seat cushion spring for 1940 models. Designed by engineers of F. L. Jacobs Co. here, the spring uses flat leaves of 0.032-inch spring steel 1½ inches wide instead of the conventional helical wire springs. Base of the cushion is a steel tube, and the leaves are formed to the approximate contour of the cross section of the cushion, with a reverse curve at the base to wrap around the tubular frame At the top of the crown the leaves are split and overlapped, with a third leaf riveted in place to form a stronger support at the center of the cushion. The flat bands are spaced about 1½ inches apart and are wired together, five to a unit. This is done to prevent the variable action of the individual leaves from cutting the upholstery layer over them.

Naturally, with the new design, the space below the spring support in the cushion is entirely open and the manufacturer suggests the installation of heaters or other equipment in this cavity. A rustproofing treatment will be given the spring members, but as yet it has not been decided what type of treatment to use, the matter of cost probably fig-

uring very prominently.

Demonstrations were made in Akron, O., last week of a new type of rubber clutch for large marine engines and oil derricks, a development of General Tire & Rubber Co. The device employs a rubber-to-steel gripping surface, and automotive applications were suggested. Engineers have been experimenting with the clutch for the past three years and their work eventually may culminate in a design adapted to automotive use.

Several new transmission designs are expected to be displayed on 1940 models. In addition to the already-mentioned Packard development are new gearing designs for Dodge and the General Motors transmission department now being set up in Detroit. A large volume of equipment still is to be installed in the latter plant, and operations probably will not be initiated until Sept. 1.

■ ANTICIPATED labor trouble among skilled tool and die makers in General Motors plants in the Flint area drew near last week as strike votes were taken in various divisions. With about 4000 out of the 8000 skilled workers involved having cast ballots, the UAW-CIO claims a large majority voting to strike..

Notice was filed with the state labor relations board of intention to take these votes, and steps were being taken by the board to bring the management and the UAW-CIO groups together. The management has stated it cannot recognize the union until the factional dispute between it and the UAW-AFL group is settled.

The latter group, under leadership of Homer Martin, appeared to be falling apart after 35 organizers and other employes were discharged because of lack of funds and the apparent unwillingness of the AFL to contribute to its support. However, last week, William Green dispatched several assistants to Detroit to attempt to work out a solution of the troubles in which the Martin group finds itself.

Some relief was in sight for companies plagued with dual unionism, such as auto producers here encountered, following the change in policy of the national labor relations board, but it is feared even though employers may petition for an election in their plants, the process may be so drawn out and so bound up in red tape that irreparable damage could be done by conflicting union groups before a settlement could be made.

Divco Twin Truck Co. here expects to occupy its new plant on Hoover road by Aug. 1. Buildings, for which steel work is now up, will provide 150,000 square feet of floor space, and will permit tripling present production.

Extensive alterations are in process at the Los Angeles plant of Chrysler, involving extensions to present buildings to yield 76,000 more square feet of floor space, new rustproofing and finishing department, new conveyors and materials handling equipment, rearrangement of assembly lines, and a new sheet metal department, the latter to be equipped with wiring machines, welders, punch presses, metal finishers and conveyors.

Chrysler Institute of Engineering, now in its eighth year of training future Chrysler executives, presented diplomas, degrees and certificates to 144 corporation employes at exercises last week. Since its founding, the institute has provided undergraduate training to over 3000 employes of Chrysler, and 130 others have been enrolled in the graduate school.

A Packard engineer, probably finding time hanging a little heavy on his hands, made a few lightning calculations the other day and came up with the information that during the year the Packard body plant will use more than 4000 miles of thread, or enough to sew suspender buttons on two pairs of pants for every man in the United States.

Plans are being drawn up at Toledo Shipbuilding Co., Toledo, O., for a new type of lake vessel, 350 feet in length, designed to carry 1000 passengers and 40 automobiles at a cruising speed of 23 miles per hour. George C. Sharp, New York, is the naval architect who is drawing up the plans for a group of Detroit sponsors.

Vacuum booster used on the Chevrolet steering column gearshift is calculated to supply 80 per cent of the energy required to move the lever, the remaining 20 per cent purposely being left for the driver so he will still have the "feel" of the shift.

A fleet of 463 taxicabs has been completed by Buick for shipment to California. The vehicles are equipped with several new safety devices, including finger guards on doors, felt pads across the tops, 45 miles-per-hour governors and safety signals on the dash indicating opening of the rear doors.

Automobile Production

Passenger Cars and Trucks—United States and Canada

By Department of Commerce

	1937	1938	1939
Jan.	399,186	227,130	353,946
Feb.	383,900	202,589	312,141
March	519,022	238,598	389,489
April	553,231	238,133	354,263
May	540,377	210,183	‡313,214
June	521,153	189,399	308,281
6 mos.	2,916,869	1,306,057	2,031,334
July	456,909	150,444	.....
Aug.	405,072	96,936	.....
Sept.	175,630	89,623	.....
Oct.	337,979	215,296	.....
Nov.	376,629	390,350	.....
Dec.	347,349	407,016	.....
Year	5,016,437	2,655,777	.....

Estimated by *Ward's Reports*

Week ended:	1939	1938†
June 3	32,445	26,980
June 10	65,265	40,175
June 17	78,305	41,790
June 24	‡81,070	40,918
July 1	70,663	40,945

†Comparable week.

	Week Ended July 1	Week Ended June 24
General Motors	22,873	20,160
Chrysler	21,810	22,650
Ford	19,600	‡19,700
All others	6,380	8,560

‡Revised.

Space Nearly Sold for Chicago Metal Show

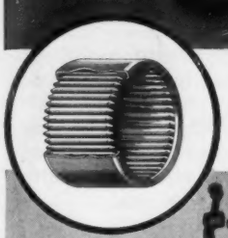
■ Plans are maturing for the twenty-first annual National Metal congress and exposition in Chicago, Oct. 23-27. Space for the exposition in the International Amphitheater already is 95 per cent reserved, according to William H. Eisenman, secretary, American Society for Metals, Cleveland, and show manager. This figure is a 15 per cent increase as compared with the 1938 show in Detroit. More than 250 metal manufacturing and processing companies will be represented with exhibits.

As in past years, the congress will feature technical meetings sponsored by the American Society for Metals, American Welding society, American Institute of Mining and Metallurgical Engineers, and the Wire association.

Topping the annual convention of the Metals society will be a symposium on "Precipitation Hardening of Metals"; a lecture course "Introduction to the Alloying Elements," by Dr. E. C. Bain, assistant to vice president, United States Steel Corp., Pittsburgh; and a lecture course on "Macroscopic Examination," by Dr. G. M. Enos, associate professor of metallurgy, University of Cincinnati, Cincinnati; in addition to the regular program of various scientific papers.

■ Bureau of business research, Ohio State University, has issued a volume of charts to give a picture of Ohio's rank among states, industrially and commercially. They show the state's position in each of 20 leading industries, retail and wholesale business; also wage and salary payments in each of ten leading industries in state and in each of eight leading counties.

705,000,000 POUNDS OF IMPACT!



Above—Photo of the Torrington Needle Bearing in a rocker arm from the test engine of the Ranger Engineering Corp., Farmingdale, N. Y. Note the perfect appearance of the bearing and shaft which served directly as the inner race.

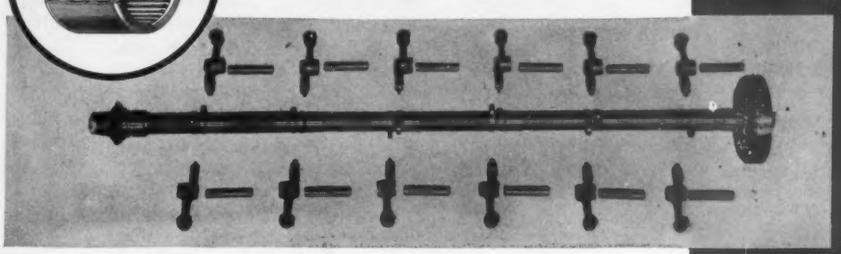
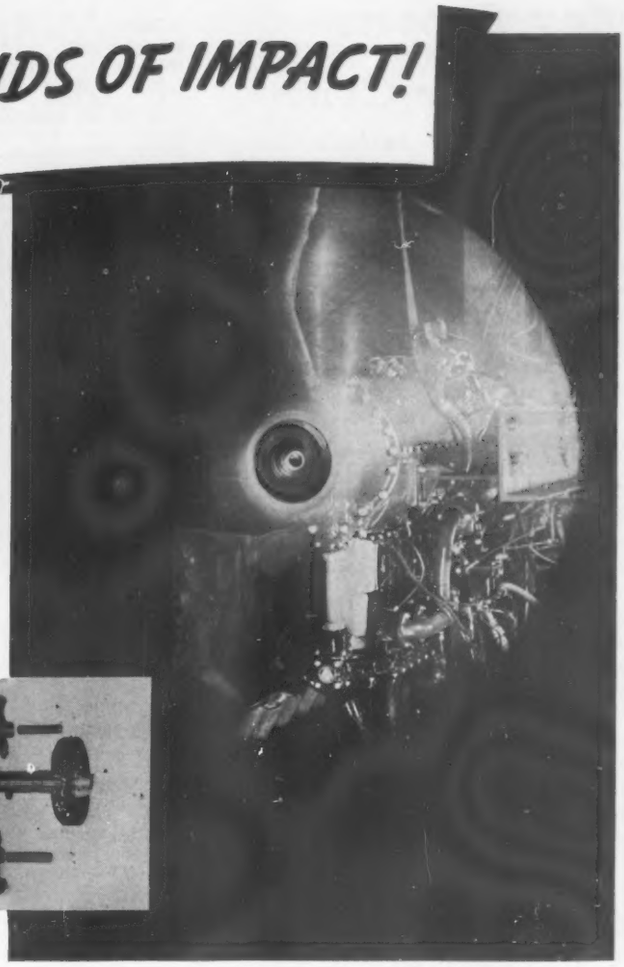


Photo above shows the camshaft and twelve rocker arms after disassembly. The camshaft rotated at 1,225 R. P. M., half engine speed.



One of the most grueling tests ever put upon an Aircraft Engine.

50-Hour, Full-throttle, Non-stop Test in Ranger Aircraft Engine Proves Torrington Needle Bearings can take it.

IMAGINE a cumulative load of 705,000,000 pounds impact in a 50-hour period—produced by 3,525,000 separate oscillations. Each oscillation imposed an impact load of 200 pounds on each of the Torrington Needle Bearings in the valve rocker arms of the Ranger Model 6-410 six-cylinder engine during a fifty-hour, full-throttle test—one of the most grueling tests which can be imposed on an aircraft engine, *a test calculated to wreck any part not perfectly engineered to its job.*

The acceleration on the bearing race was at the rate of 656 feet per second per second—an acceleration equivalent to a speed increase of 0 to 447 miles per hour in one second.

The rocker arm bearings showed no sign of wear when inspected at the end of the test. This means that rebushing on every overhaul, always a costly maintenance job in aircraft operation, will be eliminated.

But even more important are other characteristic advantages of the Torrington Needle Bearing which make it the ideal bearing for many aircraft, automotive and industrial applications. Its high radial load capacity, its small, compact size which requires no more space than a simple bushing, the extremely simplified housing required, the resulting weight reductions, all contribute to better design, greater operating efficiency and production economies.

The Torrington Needle Bearing is also surprisingly low in *unit cost* compared to any other type of anti-friction bearing.

Let our engineering department give you a demonstration of these advantages put to work in your own product so you can estimate your own increased efficiency and cost savings. We will be glad to work with you in adapting the Needle Bearing to your product requirements. Write for the Torrington Needle Bearing Catalog No. 10.

For Needle Bearings to be used in heavier service, request Booklet 103X from our associate, the Bantam Bearings Corporation at South Bend, Indiana.

The Torrington Company
ESTABLISHED 1866
Torrington, Conn., U.S.A.
Makers of Ball and Needle Bearings
Branch Offices in all Principal Cities

TORRINGTON
NEEDLE BEARING

May Exports Off 4 Per Cent

■ EXPORTS of iron and steel products, excluding scrap, in May totaled 147,760 gross tons, 4 per cent less than 153,884 tons in April, according to metals and minerals division, bureau of foreign and domestic commerce. In May, 1936, exports were 166,308 tons.

May exports were valued at $11,661,926, against an April valuation of $12,245,537, both higher than the $10,894,674 trade in May, 1938. Aggregate exports in five months this year were 733,307 tons valued at $56,464,410, compared with 967,397 tons valued at $64,517,991 in the comparable period in 1938.

Canada was chief buyer of American iron and steel products in May, 18,893 tons, including 3306 tons of nonalloy black sheets, 2769 tons of plain shapes and 2120 tons of nonalloy cold-rolled strip. Sweden was second with 12,870 tons, including 5946 tons of nonalloy plates and 3705 tons of pig iron. Japan was third with 12,432 tons, which included 6163 tons of nonalloy ingots and 1205 tons of car axles without wheels. Other leading export markets were Brazil, 11,767 tons, the Netherlands, 11,512 tons and the Philippines, 10,770 tons.

Nonalloy plates led in tonnage with 20,611 tons. Nonalloy black sheet shipments totaled 18,761 tons, tin plate 16,124 tons.

Scrap exports were up sharply in May with 384,881 tons, valued at $5,638,013, against 240,124 tons valued at $3,595,271 in April and 374,320 tons valued at $5,520,068 in May, 1938. In the first five months this year total scrap exports were 1,390,064 tons, 15 per cent less than 1,636,247 tons shipped in the corresponding months last year.

Japan led in scrap shipments in May, taking 198,686 tons. The United Kingdom's scrap shipments were 60,798 tons, Italy 48,007 tons and Poland and Danzig, 26,562 tons.

UNITED STATES EXPORTS OF IRON AND STEEL PRODUCTS

Gross Tons

Articles	May 1939	April 1939	Jan. thru May,'39
Pig iron	6,737	1,599	20,244
Ferromanganese and Spiegeleisen	2	7	36
Other ferroalloys	141	50	384
Ingots, blooms, etc.:			
Not containing alloy	6,927	4,620	40,762
Alloy, incl. stainless	18	1,614	6,356
Steel bars, cold fin.	571	447	3,348
Bars, iron	23	72	268
Bars, concrete	1,891	2,970	10,891
Other steel bars:			
Not containing alloy	8,966	7,569	43,197
Stainless steel	5	51	188
Alloy, not stainless	2,108	752	6,349
Wire rods	1,881	1,791	7,039
Boiler plates	377	422	2,652
Other plates, not fab.:			
Not containing alloy	20,611	23,252	101,880
Stainless steel	14	5	36
Alloy, not stainless	141	83	402
Skelp iron or steel	711	824	3,628
Sheets, galv. iron	382	834	2,365
Sheets, galv. steel	6,854	8,759	35,574
Sheets, "black" steel:			
Not containing alloy	18,761	21,568	112,288
Stainless steel	109	92	370
Alloy, not stainless	518	195	1,381
Sheets, black iron	630	377	2,776
Strip steel, cold-rolled:			
Not containing alloy	1,007	1,446	8,078
Stainless steel	47	67	236
Alloy, not stainless	83	52	200
Strip steel, hot-rolled:			
Not containing alloy	4,436	2,712	20,601
Stainless steel	2	46	148
Alloy, not stainless	5	4	15
Tin plate, taggers' tin	16,124	16,740	73,237
Terne plate	376	556	1,543
Tanks, except lined	2,020	2,081	8,798
Shapes, not fabricated	6,891	7,219	31,639
Shapes, fabricated	2,626	3,180	12,826
Plates, fabricated	108	281	1,004
Metal lath	50	78	394
Frames and sashes	81	99	417
Sheet piling	236	727	1,816
Rails, 60 lbs.	2,947	6,559	19,564
Rails, under 60 lbs.	588	226	1,119
Rails, relaying	1,649	.....	3,489
Rail fastenings	598	561	3,365
Switches, frogs, crsgs.	194	320	1,057
Railroad spikes	266	253	1,514
R. R. bolts, nuts, etc.	70	187	666
Boiler tubes, seamless	590	604	2,669
Boiler tubes, welded	105	96	217
Pipe:			
Smls. casing, oil-line	6,649	5,930	25,791
Do. welded	53	448	1,129
Seamless, black	802	590	3,000
Pipe fittings:			
Mall. iron screwed	307	323	1,457
Cast iron screwed	190	228	823
Pipe and fittings for:			
Cast iron pressure	377	3,689	8,564
Cast iron soil	434	594	2,872
Pipe, welded:			
Black steel	1,482	1,602	6,826
Black wrought iron	144	137	1,344
Galvanized steel	1,664	1,934	9,033
Galv. wrought iron	194	196	1,135
*All other pipe, fittings	370	336	1,542
Wire:			
Plain iron or steel	1,851	1,888	10,260
Galvanized	1,686	1,840	9,894
Barbed	3,600	3,626	14,946
Woven-wire fencing	257	240	1,266
Woven-wire screen cloth:			
Insect	46	37	185
Other	100	127	578
Wire rope and cable	262	511	1,682
Wire strand	69	79	417
Electric welding rods	113	153	563
Card clothing	1	9	24
Other wire	542	629	2,768
Wire nails	1,528	1,486	7,215
Horseshoe nails	102	53	361
Tacks	20	26	102
Other nails, staples	305	254	1,471
Bolts, machine screws	645	722	3,276
Castings:			
Gray iron (incl. semi-steel)	194	459	1,440
Malleable iron	82	71	523
Steel, not alloy	58	56	397
Alloy, incl. stainless	166	54	614
Car wh'ls, tires, axles:			
† Wheels and tires	677	1,095	4,312
† Axles, no wheels	1,416	923	3,714
† Axles with wheels	200	32	1,453
Horseshoes and calks	.....	83	120
Forgings, N. e. s.:			
Not containing alloy	1,460	1,166	4,306
Alloy, incl. stainless	237	212	878
Total	147,760	153,884	733,307
Scrap, iron and steel	382,642	237,691	1,378,694
Scrap, tin plate	728	762	4,018
Tin plate circles, strips, cobbles, etc.	656	636	3,057
Waste-waste tin plate	855	1,035	4,295
Total scrap	384,881	240,124	1,390,064
GRAND TOTAL	532,641	394,008	2,123,371
Iron ore	54,743	312	122,268

*New class. Includes flanged malleable cast iron fittings, expansion joints, and riveted pipe and fittings.
†New class.

Machinery Exports Close to Record Level

■ Exports of industrial machinery in May were valued at $26,085,746, a gain of 11 per cent over $23,544,012 in May, 1938, and closely approaching the record monthly shipments in March of this year, which totaled $29,594,195, as reported by the machinery division, department of commerce.

Power-driven metalworking equipment exports, which dropped from the March peak of $12,057,000 to $8,854,755 in April, recovered in May to $11,615,799, the second highest figure on record, a gain of 28 per cent over May, 1938, valued at $9,078,953. Largest buyers were Japan, the United Kingdom, Russia and France.

Power generating equipment, except electric and automotive, declined 25 per cent from May, 1938, May value being $1,185,654 against $1,573,948 in May, 1938. Construction and conveying equipment shipments were 9 per cent less.

American Machinery Preferred in Greece

■ Despite preferential treatment given German goods under quota provisions American machinery made substantial progress in the Greek market in 1938, the department of commerce reports. American machinery imported by Greece in 1938 was valued at $365,000, a 94 per cent increase over $188,000 in 1937. In 1936 such imports were valued at only $81,000.

Superior quality and design in American equipment is recognized and with improvement in the quota situation would be preferred to German, the report states. Imports could be increased to $750,000 value in 1939 if permits could be obtained with reasonable promptness.

Farm Implement Exports Hold Steady Rate

■ Exports of farm implements and machinery in May showed little change from the corresponding month last year, totaling $6,548,384 against $6,545,386, the machinery division, department of commerce, reports.

Smaller shipments in various types were more than balanced by larger consignments of wheel and fuel-injection type tracklaying tractors. Tractor and parts shipments in May were valued at $4,814,843, an increase of 11 per cent over $4,345,905 in May, 1938. Tractors accounted for 73 per cent of total farm equipment shipments in May, compared with only 66 per cent a year ago.

Monarch Celebrates Thirtieth Year; Crowds Visit New Factory, Offices

■ THIRTIETH anniversary of the founding of Monarch Machine Tool Co., Sidney, O., was celebrated June 23-25 with an openhouse, marking also completion and dedication of the company's extensive factory addition and its new air conditioned office building which likewise houses the enlarged engineering department.

The celebration began Friday evening with the tenth anniversary dinner meeting of the Sidney Foremen's club, attended by officers of the National Association of Foremen. This meeting was held in the spacious auditorium of the new office building. Guest of honor was Wendell E. Whipp, president of the Monarch company and also of the National Machine Tool Builders' association.

Capt. A. A. Nichoson, Texaco Corp., New York, the principal speaker, paid tribute to Mr. Whipp for his achievement in building up the company from a little-known organization in small quarters and employing less than 50 men, to a machine tool concern known all over the world, housed in a large, modern plant and now employing nearly 600. Mr. Whipp joined the company in 1912 as general manager.

The Friday evening affair brought nearly 200 to view the enlarged plant, many coming from Dayton and other Ohio and Indiana cities. Crowds arrived on the two following days when plant and office building were thrown open to the public. The number of visitors was more than 10,000. Among them were the families of Monarch workmen, many of whom have been with the company for 25 years, and some since its founding.

An elaborate and ingenious exhibit was used to emphasize the important role played by machine tools in modern life. This showed, by actual units and with the aid of pictures, development of the telephone, automobile, household refrigeration, sanitation, food packing, milk retailing, aircraft, washing machines. The part played by lathes and other machine tools in perfecting these developments was made clear by cleverly worded cards displayed on each exhibit.

The plant expansion provides additional space for assembly, as well as inside loading for trucks and freight cars. In addition to enlarged executive and general offices, and doubled capacity for the engineering department, the new office building has in the basement a modern cafeteria to serve 250 at one time. The auditorium on the second floor seats 400. Also in this building is a large class room and a completely equipped photographic laboratory. In all, 35,018 square feet have been added, bringing the total area of the plant up to 133,897.5 square feet.

"Story of Scrap" in Booklet Form

■ *The Story of Scrap*, a 22-page booklet, has been issued by Institute of Scrap Iron and Steel Inc., 11 West Forty-second street, New York, for free distribution to those interested. Written by Edwin C. Barringer, executive secretary, it is in non-technical language, to give the layman some idea of the scope and operation of the industry.

After defining scrap the author tells how it is prepared, marketed, priced and used, discusses questions of supply and exports and presents vital statistics, including production, exports and imports, compared with steel ingot production, from 1910 to date.

Philadelphia Steel Club Holds Annual Outing

■ More than 400 executives attended the annual outing of the Steel Club of Philadelphia June 23 at Aronimink country club near Philadelphia.

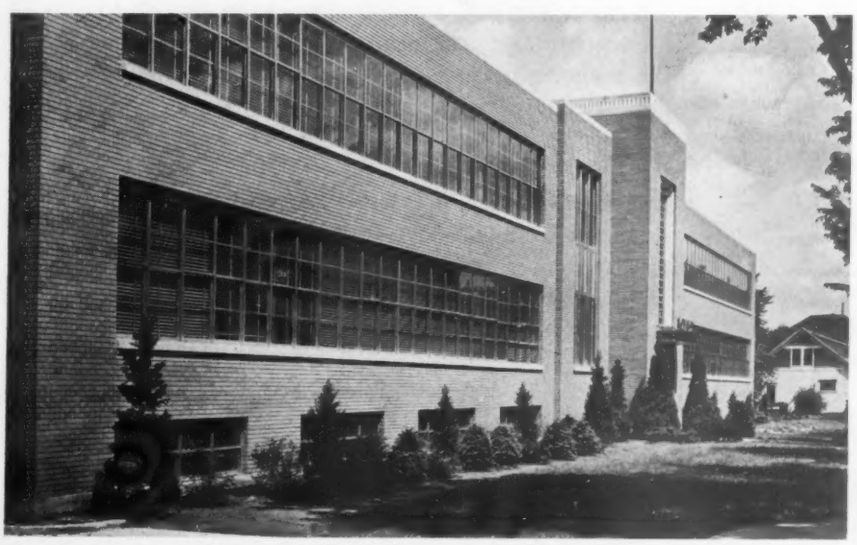
H. L. Beyer Sr., Edgcomb Steel Co., Philadelphia, had low gross score at golf and Joel Turnbull, E. I. du Pont de Nemours & Co., Wilmington, Del., second low. F. B. Shepherd had low net score and Paul Schmidt, Crown Can Co., Philadelphia, second low.

L. F. Gieg, Crown Can Co., Philadelphia, won first draw in the stunt contest, driving a screw-studded ball out of a miniature "lake" to the green. Harry Rowbotham, Belmont Iron Works, Philadelphia, won the proximity contest on the eighth green. A. J. Somerville, Thomas Somerville Co., Washington, second. On the seventeenth, E. H. Thomas, Bond Mfg. Co., Wilmington, was winner with William Vaughan, Steel Distributors Inc., Philadelphia, second.

P. B. Burtis, Bethlehem Steel Co., was in charge of arrangements. H. E. Richardson, Youngstown Sheet & Tube Co., was registration committee chairman, assisted by S. H. Baker, Sharon Steel Corp.; R. H. McCracken, Central Iron & Steel Co.; T. J. Gerwig, Republic Steel Corp.; R. H. Clapp, John A. Roebling's Sons Co.

The starting committee was headed by C. H. Stoeckle, Crucible Steel Co., with Paul M. King, Worth Steel Co.; W. O. Lange, Phoenix Iron Co.; W. R. Murphy, Allegheny Ludlum Steel Corp.; W. Steytler, Jones & Laughlin Steel Corp., and L. L. Anderson, American Steel & Wire Co., assisting.

J. B. DeWolf, Jones & Laughlin Steel Corp., was in charge of stunt and proximity contests, C. M. Mackall, Bethlehem Steel Co., assisting. H. W. Merriman, Alan Wood Steel Co. handled the prizes. Mr. Merriman is president of the club, and James A. Fisher, Wheeling Steel Corp., vice president.



■ **Completion of Monarch Tool Co.'s new factory addition and air-conditioned office building in Sydney, O., climaxes five years of steady expansion during which the company's employment has more than doubled**

Editorial

■ THE steel industry rapidly is getting itself into a position of inviting new controls over its management. By its "no-profit" policy it is helping to give point to recent contentions in some political circles that the character of the management in the industry should be changed radically, with government or labor, or both, in the saddle. The same policy is the cause of growing concern among investors.

Depression or no depression, there can be little defense for management that during the past nine years borrowed more than $500,000,000 and during the same period lost more than $88,000,000.

Steel notoriously has been a poor merchandizer. It was quite customary, around the turn of the century, for pool members to raise a price and then dash madly to nearby telephones and secretly instruct their sales forces to cover all customers at the old price. Rough, rugged and individualistic steel always has chafed, as in a strait-jacket, against price stability. Even during the NRA period legally fixed prices were violated despite the imposition of heavy fines.

New Conditions Prevent Building Reserves for Years of Famine

An old-timer used to say: "The only way to have stable prices on steel is to make price cutting a penitentiary offense—and it would not work until half of the industry's executives were behind the bars."

In the past steel was a feast or a famine and the inherent opposition to stability did not prevent the industry from flourishing, for in times of fat it accumulated financial reserves that tided it over times of lean, and enabled it to finance its constant fight against obsolescence and high costs. But today steel is mostly a famine. The industry has no control over such basic cost factors as unit wage rates. High taxes and government policies combine to discourage the accumulation of financial reserves. Under prevailing conditions, the traditional price cutting propensity of the steel industry is plunging it to disaster.

One of the factors that undoubtedly is responsible for selling steel below the cost of production is the widespread ignorance as to what it costs to produce a ton of finished product. In many companies the cost is a secret reserved for top executives and key men. Some key production men are informed what the manufacturing cost is, but know nothing about overhead. Practically all companies refrain from arming salesmen with such information. And it is only on rare occasions that any worthwhile information about costs is given out by responsible executives in the steel industry.

Overhead Important Factor; Veil of Secrecy Should Be Torn

Some steel executives, declares Mr. Kulas (STEEL, June 26, p. 16), justify price reductions by telling themselves that "overhead goes on anyway whether the plant is operating or not, and that they might just as well get what they can while the getting is good." Many instances might be cited to prove that this is the case. For example, full-finished sheets, during the recent "orgy of competition," sold at $50 a ton; whereas the manufacturing cost of these sheets in an efficiently operated plant is around $47.50, the total cost, including $15 overhead, is $62.50.

The old policy of secrecy about costs should be abandoned. Cost should be thoroughly understood, certainly by top executives, but also by the whole rank and file of the industry. And the whole steel industry should be thoroughly aware that a profit can be made only by selling at a certain amount over the total cost.

One suggestion that has been made lately deserves consideration. This is a proposal that the American Iron and Steel institute set up a special committee to study production costs and so publicize its findings as to make the industry cost-conscious.

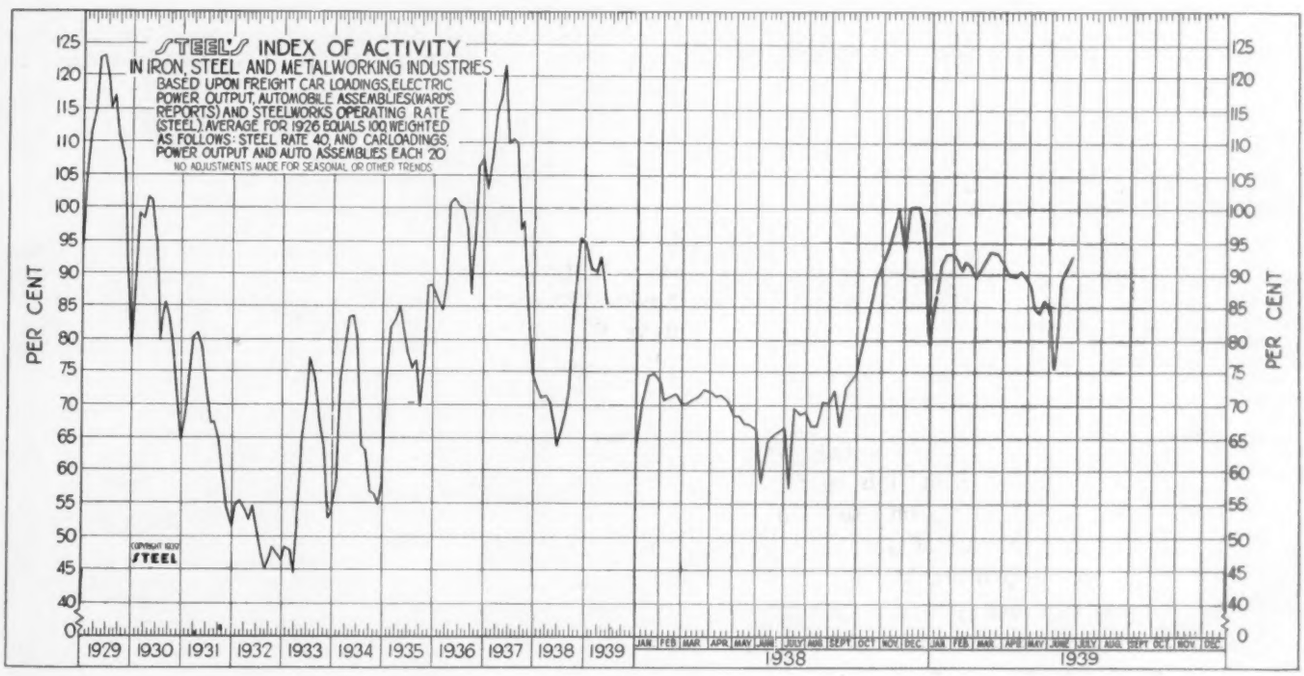
The BUSINESS TREND

Industry Is Staging Good Contra-Seasonal Show

■ STEEL'S index of activity in the iron, steel and metalworking industry has recorded the third consecutive weekly gain since Memorial day week. The recent increase of 2.1 points for the week ended June 24 forced the index to the highest level since March 28. The index now stands at 93.0, well above the 66.0 level recorded in the comparable week last year. However, in the corresponding week in 1937 the index stood at 112.8.

Each of the four business indicators composing STEEL'S index advanced in the week ended June 24. Steelmaking operations increased 2 points to 54.5 per cent, to more than offset the decline in the preceding week. The national steel rate is now at the highest level since the week ended, April 1. This important business barometer has recorded a net gain of 9 points since the low point this year of 45.5 recorded in the week ended May 20. In contrast with this showing the national steel rate fluctuated between 45.5 and 56.5 per cent in the preceding 20 weeks. Current indications seem to point to a leveling off in steelworks operations over the next few weeks.

Automobile production increased moderately in the week ended June 24, in what is regarded as the last full week of the 1939 model season. At least six manufacturers have completed this year's model run and by the middle of July virtually all the General Motors and Chrysler plants will close down for the retooling


STEEL'S INDEX OF ACTIVITY
IN IRON, STEEL AND METALWORKING INDUSTRIES
BASED UPON FREIGHT CAR LOADINGS, ELECTRIC POWER OUTPUT, AUTOMOBILE ASSEMBLIES (WARD'S REPORTS) AND STEELWORKS OPERATING RATE (STEEL) AVERAGE FOR 1926 EQUALS 100 WEIGHTED AS FOLLOWS: STEEL RATE 40, AND CARLOADINGS, POWER OUTPUT AND AUTO ASSEMBLIES EACH 20
NO ADJUSTMENTS MADE FOR SEASONAL OR OTHER TRENDS
PER CENT
1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939
1938
1939

STEEL'S index of activity gained 2.1 points to 93.0 per cent in the week ended June 24:

Week ending	1939	1938
April 8	90.0	71.3
April 15	89.7	71.4
April 22	90.4	70.8
April 29	89.2	68.4
May 6	85.1	68.5
May 13	84.2	67.2
May 20	86.6	67.1
May 27	85.4	66.5
June 3	75.9	58.1
June 10	88.2	64.4
June 17	90.9	65.2
June 24	93.0	66.0

Mo. Data	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929
Jan.	91.1	73.3	102.9	85.9	74.2	58.8	48.6	54.6	69.1	87.6	104.1
Feb.	90.8	71.1	106.8	84.3	82.0	73.9	48.2	55.3	75.5	99.2	111.2
March	92.6	71.2	114.4	88.7	83.1	78.9	44.5	54.2	80.4	98.6	114.0
April	89.8	70.8	116.6	100.8	85.0	83.6	52.4	52.8	81.0	101.7	122.5
May	85.3	67.4	121.7	101.8	81.8	83.7	63.5	54.8	78.6	101.2	122.9
June	....	63.4	109.9	100.3	77.4	80.6	70.3	51.4	72.1	95.8	120.3
July	....	66.2	110.4	100.1	75.3	63.7	77.1	47.1	67.3	79.9	115.2
Aug.	....	68.7	110.0	97.1	76.7	63.0	74.1	45.0	67.4	85.4	116.9
Sept.	....	72.5	96.8	86.7	69.7	56.9	68.0	46.5	64.3	83.7	110.8
Oct.	....	83.6	98.1	94.8	77.0	56.4	63.1	48.4	59.2	78.8	107.1
Nov.	....	95.9	84.1	106.4	88.1	54.9	52.8	47.5	54.4	71.0	92.2
Dec.	....	95.1	74.7	107.6	88.2	58.9	54.0	46.2	51.3	64.3	78.3

period subsequent to starting on 1940 models. Motor car output increased 2765 units to 81,070 in the week ended June 24, while at this time last year output was placed at 40,918 units.

Automobile assemblies during June will approximately equal those of May, or slightly exceed them. This contra-seasonal showing is somewhat misleading because labor troubles during May helped to bolster the June total output. However, the moderately improved volume of retail sales has been a factor in supporting June assembly schedules.

Revenue freight traffic increased slightly in the week ended June 24, to touch another new high for this year. Freight carloadings in that week were 642,987, compared with the 637,873 cars loaded in the previous week. In the corresponding week last year freight traffic totaled 558,937, while in the same 1937 period loadings were well above the current level at 773,733. The recent increase in railroad freight traffic is contra-seasonal and represents the third consecutive weekly gain since Memorial day week.

The fourth business indicator composing STEEL'S index to record a gain in the week ended June 24 was electric power consumption. Power output of 2,285,083,000 kilowatt-hours in that week touched the highest level since the week ended Feb. 4, and remains well above the comparable week last year.

While temporary interruptions of the current upward tendency among certain industrial groups are to be expected, business prospects through the summer months are for a relatively small revival in activity dependent to a considerable degree on consumer spending. An expansion in the investment of private capital, upon which alone a broad and far-reaching revival is based, is not yet in sight. The spark which could create a real capital goods revival out of the huge idle bank deposits is just as much lacking today as a year ago.

Where Business Stands

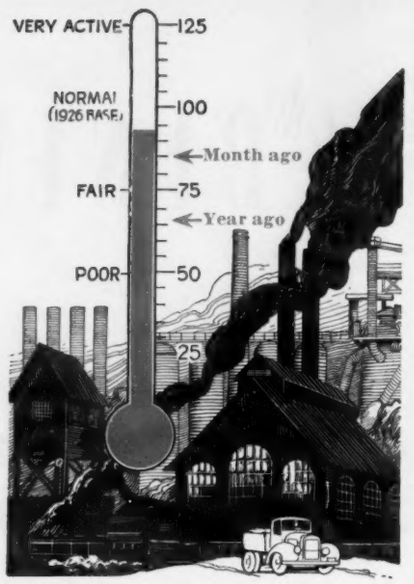
Monthly Averages=100

	May, 1939	Apr., 1939	May, 1938
Steel Ingot Output	119.5	132.1	79.9
Pig Iron Output	107.4	132.9	78.9
Freight Movement	102.5	97.1	94.8
Building Construction	112.0	123.9	106.3
Automobile Production	141.5	159.1	94.9
Wholesale Prices	96.9	96.7	99.4

Industrial Weather

TREND:

Upward



The Barometer of Business

Industrial Indicators

	May, 1939	April, 1939	May, 1938
Pig iron output (daily average, tons)	55,373	68,511	40,675
Machine tool orders index 3-months' moving ave.	219.8	155.6	66.7
	186.9	169.4	88.0
Foundry equipment new order index	108.8	146.0	90.6
Finished steel shipments	723,165	701,459	465,081
Ingot output (daily average, tons)	108,069	119,479	72,272
Nat'l Ind. Conf. board inventory indices:†			
Raw materials	97.6	98.3	116.7
Semifinished goods	113.4	113.3	121.9
Finished goods	111.0	110.0	114.9
Dodge building awards in 37 states (valuation)	$308,487,000	$330,030,000	$283,156,000
Automobile output	313,214	354,263	210,183
Coal output (tons)	17,880,000	10,747,000	21,231,000
Business failures, number	1,122	1,140	1,123
Business failures: liabilities	$14,757,000	$17,492,000	$19,139,000
Nat'l Ind. Conf. board (25 industries, factory):†			
Av. wkly. hrs. per worker	36.8	36.9	32.9
Av. weekly earnings	$26.27	$26.25	$23.53
Cement production (bbls.)†	9,674,000	8,171,000	7,983,000
Cotton consumption (bales)	605,353	546,702	426,149
Car loadings (weekly av.)	587,935	557,002	543,956

†April, March and April, respectively.

Foreign Trade

	April, 1939	March, 1939	April, 1938
Exports	$230,947,000	$267,602,000	$274,472,000
Imports	$186,195,000	$190,453,000	$159,827,000
Gold exports	$231,000	$53,000	$145,000
Gold imports	$606,027,000	$365,436,000	$71,236,000

Financial Indicators

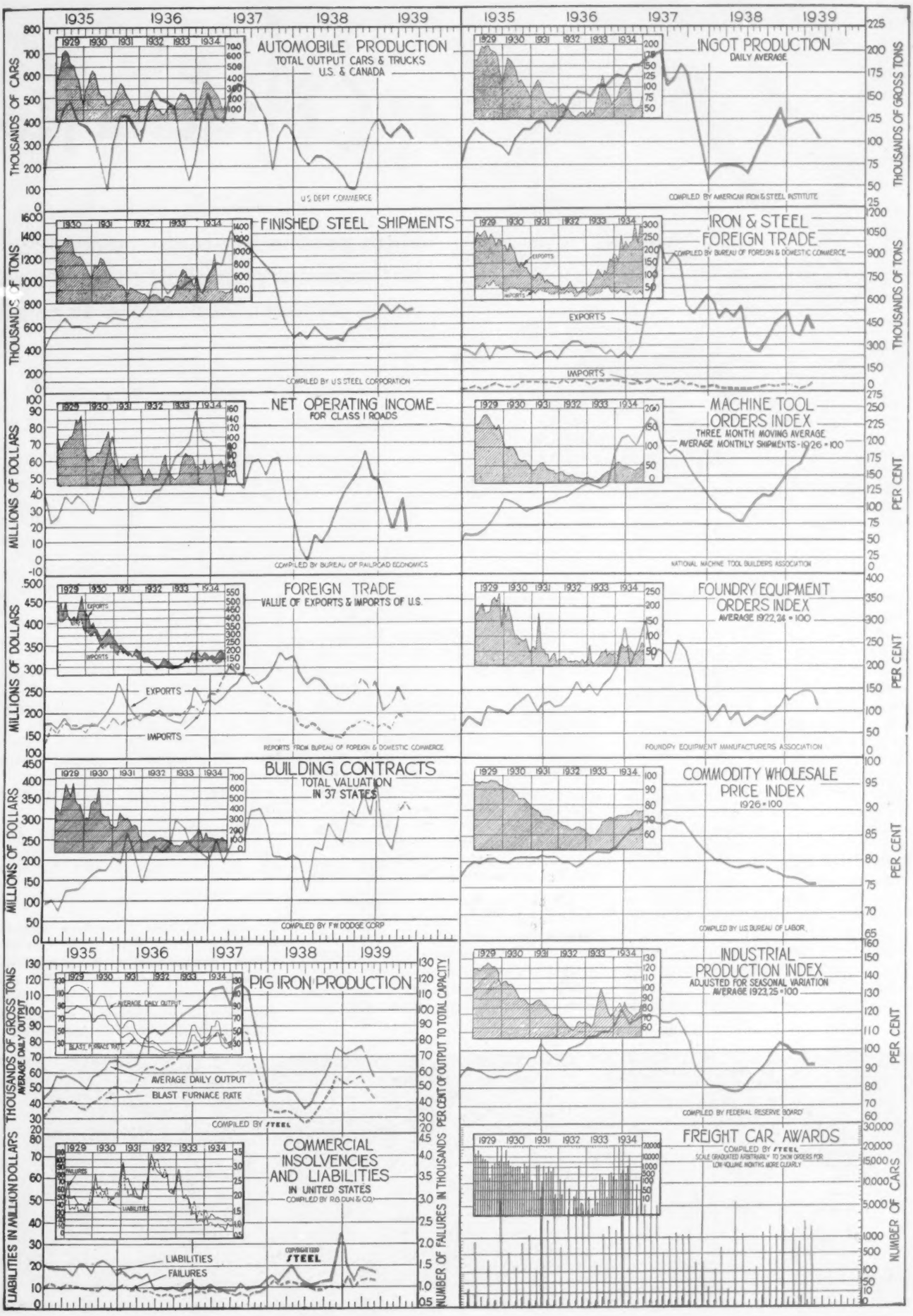
	May, 1939	April, 1939	May, 1938
25 Industrial stocks	$167.73	$161.51	$143.93
25 Rail stocks	$20.67	$19.41	$17.01
40 Bonds	$70.77	$70.16	$67.99
Bank clear'gs (000 omitted)	†$21,798,000	*$24,995,000	$21,667,000
Commercial paper rate, New York (per cent)	½—⅝	½—⅝	1
*Com'l loans (000 omitted)	$8,126,000	$8,100,000	$8,334,000
Federal Reserve ratio (per cent)	85.4	85.1	82.5
Capital flotations:			
New capital	$116,623,000	$142 621,000	$158,843,000
Refunding	$1,195,383,000	$213,320,000	$61,434,000
Federal gross debt (millions of dollars)	$40,282	$40,063	$37,424
Railroad earnings	$15,256,935	$34 316,888	$9,397,133
Stock sales, New York stock exchange	12,932,710	20,247,438	14,007,564
Bond sales, par value	$123,260,000	$122,651,425	$121,323,925

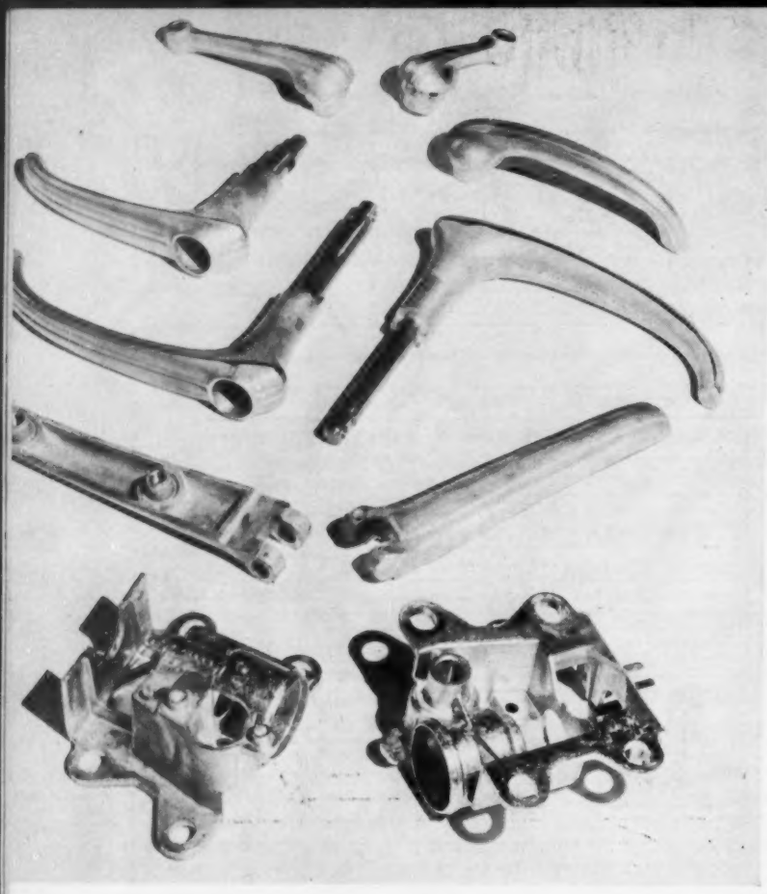
*Leading member banks Federal Reserve System.

†April, March and April, respectively.

Commodity Prices

	May, 1939	April, 1939	May, 1938
STEEL'S composite average of 25 iron and steel prices	$35.80	$36.34	$38.50
U. S. Bureau of Labor's index	76.2	76.2	78.1
Wheat, cash (bushel)	$1.00	$0.90	$0.93
Corn, cash (bushel)	$0.66	$0.64	$0.71


1935
1936
1937
1938
1939
AUTOMOBILE PRODUCTION
TOTAL OUTPUT CARS & TRUCKS
U.S. & CANADA
THOUSANDS OF CARS
U.S. DEPT. COMMERCE
INGOT PRODUCTION
DAILY AVERAGE
THOUSANDS OF GROSS TONS
COMPILED BY AMERICAN IRON & STEEL INSTITUTE
FINISHED STEEL SHIPMENTS
THOUSANDS OF TONS
COMPILED BY U.S. STEEL CORPORATION
IRON & STEEL
FOREIGN TRADE
COMPILED BY BUREAU OF FOREIGN & DOMESTIC COMMERCE
EXPORTS
IMPORTS
THOUSANDS OF TONS
NET OPERATING INCOME
FOR CLASS I ROADS
MILLIONS OF DOLLARS
COMPILED BY BUREAU OF RAILROAD ECONOMICS
MACHINE TOOL
ORDERS INDEX
THREE MONTH MOVING AVERAGE
AVERAGE MONTHLY SHIPMENTS - 1926 = 100
PER CENT
NATIONAL MACHINE TOOL BUILDERS ASSOCIATION
FOREIGN TRADE
VALUE OF EXPORTS & IMPORTS OF U.S.
EXPORTS
IMPORTS
MILLIONS OF DOLLARS
REPORTS FROM BUREAU OF FOREIGN & DOMESTIC COMMERCE
FOUNDRY EQUIPMENT
ORDERS INDEX
AVERAGE 1922,24 = 100
PER CENT
FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION
BUILDING CONTRACTS
TOTAL VALUATION
IN 37 STATES
MILLIONS OF DOLLARS
COMPILED BY F.W. DODGE CORP
COMMODITY WHOLESALE
PRICE INDEX
1926 = 100
PER CENT
COMPILED BY U.S. BUREAU OF LABOR
PIG IRON PRODUCTION
AVERAGE DAILY OUTPUT
BLAST FURNACE RATE
THOUSANDS OF GROSS TONS
AVERAGE DAILY OUTPUT
PER CENT OF OUTPUT TO TOTAL CAPACITY
COMPILED BY STEEL
INDUSTRIAL
PRODUCTION INDEX
ADJUSTED FOR SEASONAL VARIATION
AVERAGE 1923,25 = 100
PER CENT
COMPILED BY FEDERAL RESERVE BOARD
COMMERCIAL
INSOLVENCIES
AND LIABILITIES
IN UNITED STATES
COMPILED BY R.G. DUN & CO.
FAILURES
LIABILITIES
LIABILITIES IN MILLION DOLLARS
NUMBER OF FAILURES
COPYRIGHT 1939 STEEL
FREIGHT CAR AWARDS
COMPILED BY STEEL
SCALE GRADUATED ARBITRARILY TO SHOW ORDERS FOR LOW-VOLUME MONTHS MORE CLEARLY
NUMBER OF CARS



Automotive

High production requirements permit extremely efficient tooling and arrangement of conveyors. In some

By HERBERT CHASE

■ NO PLANT quite matches the system for producing die castings employed at Ternstedt division, General Motors Corp., Trenton, N. J. Here are made many items of body hardware and fittings for General Motors' cars.

Other plants, including one Ternstedt plant in Detroit, produce larger quantities and a greater variety of finished die castings, but none can boast arrangements so completely mechanized for continuous conversion of raw metals into castings. The system of conveying alone deserved a separate article (STEEL, Nov. 14, 1938, p. 57). A subsequent article will describe polishing, buffing, chemical cleaning, plating and assembly.

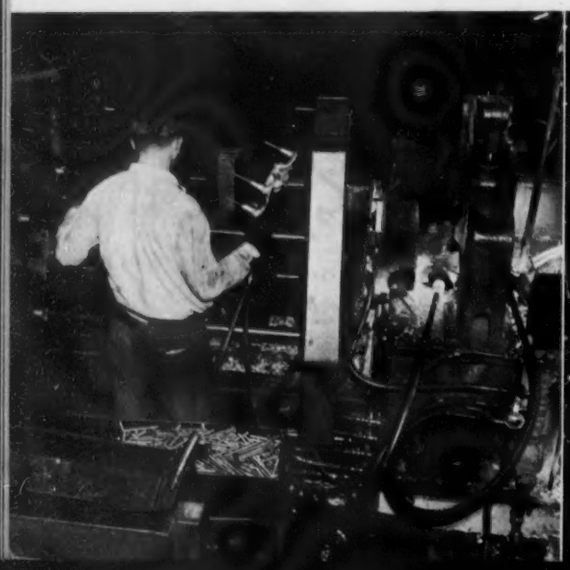
Orderly and efficient production is greatly facilitated by modern layout of equipment and by confining production to a relatively few castings of small size. These are required in large quantities and are capable of being cast in multiple-cavity dies. This makes it feasible to employ machines especially adapted and equipped for particular jobs. Most die casting plants must handle constantly changing long and short runs so the most efficient tooling is not often justified, as it is in this plant. Here there is a continuous flow from raw materials to where finished castings are packed for shipment.

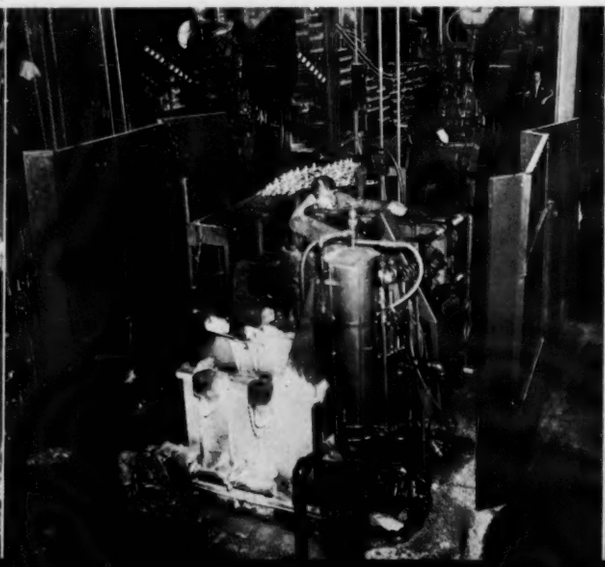
All the die castings are produced in a single zinc alloy, a high-purity zinc with small percentages of aluminum, magnesium and copper added. A stock of ready-alloyed slabs or ingots for breakdown emergencies is kept on hand to avoid delays.

Production starts with the preparation of alloys, the zinc being melted in four furnaces and alloying elements added in liquid form, these elements having been melted in two separate tilting furnaces. Alloying metals are weighed on crane scales, zinc on one of three 5000-pound subtracting type platform scales. A platform scale is located near each of the zinc furnaces, operated in pairs. As zinc is weighed, it is shifted onto a short roller conveyor at the elevated scale platform level and rolled through the charging door of the furnace. Adjacent to each platform scale, but at a higher level, is a hopper containing gates and sprues, a certain proportion of these being added to each new charge.

Alloy-melting furnaces are discharged into a weighing crane ladle. This is emptied into the zinc

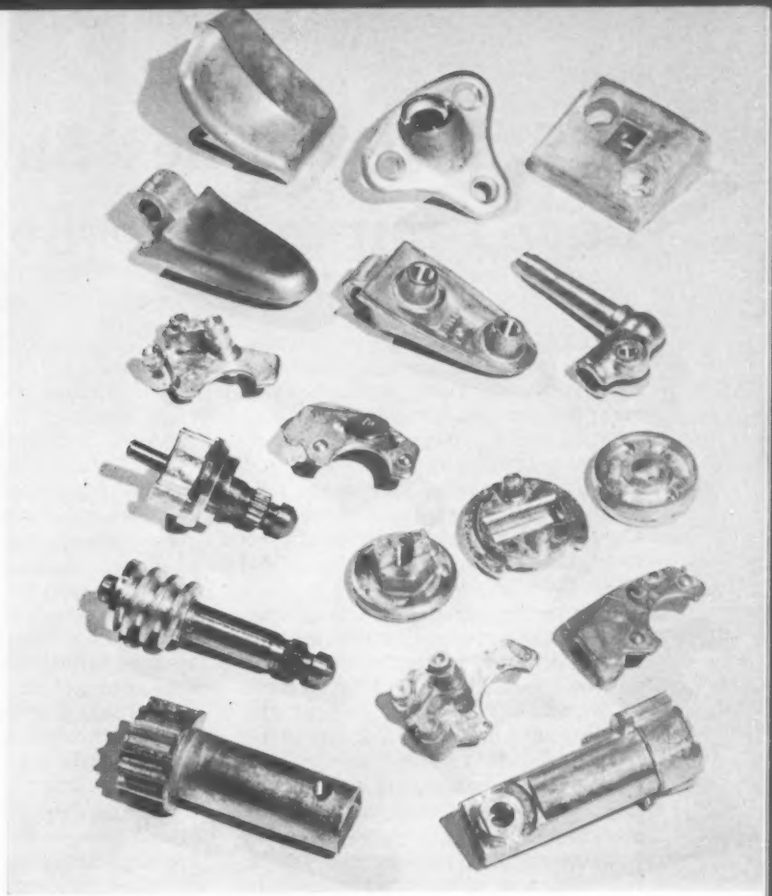
Extreme left, here plain type outside door handles are being cast. Note insert magazine next to wall opposite operator. Left, general view of die casting machine and trim press. Below, view of metal alloying equipment, zinc storage area is in foreground





Die Castings

instances, only two hours elapse from receipt of raw materials to shipment of product



furnace where the liquid alloy is stirred into the molten zinc by hand.

Die casting machines are charged from a monorail crane ladle, filled by syphoning molten metal from the zinc furnaces. The syphon is merely a U-shaped steel pipe, filled in the furnace. Then one end is brought out in a hand ladle having a deep cylindrical bucket into which one end of the syphon dips. When filled, the monorail crane ladle is shifted to each die casting machine for filling the hot-metal pots. No melting at the machines is necessary except when warming at the start of the single 8-hour shift.

There are 13 duplicate die casting machines of Ternstedt design. Dies are opened and closed by a hydraulically operated toggle mechanism. Unlike most die casting machines, metal is forced into the machine by a hydraulically operated (rather than by an air operated) plunger. Hydraulic pressure is supplied through a line at 1000 pounds per square inch.

Machines run about 300 to 325 shots an hour with no inserts and slower when inserts are required. One machine casting door handles uses a die fitted with a magazine to feed a plain, cylindrical, steel rod insert into each of four cavities. Machining required on the insert is done subsequent to casting. Other door handles requiring machined inserts have the inserts placed by hand.

Area given over to die casting measures about 600 feet long by 120 feet wide. The 13 die casting machines occupy three sides of a square area near one end, their metal pots being lined up for ready supply of metal from the monorail crane ladle. Four of the machines cast chiefly outside door handles and are located at one side of the square. Three, which cast inside hardware and trunk hinges, are along another side with metal pots toward the melting furnaces. The remaining six are along the third side and produce a variety of miscellaneous parts. Each group has its own set of conveyors, presses for shearing fins, and machine tools for reaming, tapping, facing and similar operations. Castings from this point are ready for polishing.

Gates with castings are removed from the machines by hand with tongs and are quenched in water in an adjacent tank. From here they are either dropped into a chute going directly to a punch press for shearing fins or they are placed on a belt conveyor parallelling the row of machines. Gates of castings are removed from the belt either at a press set up for fin removal from

(*Please turn to Page* 74)

Right, typical trim press setup showing a trim operation on a gear box housing, and conveying equipment. Extreme right, cam die for broaching flash from horseshoe spring and knob insert holes

A. S. T. M. Studies Steels for Low-Temperature Service

■ METALS capable of giving satisfactory service at low temperatures; properties of irons, wrought and cast; fatigue and corrosion; coal and gaseous fuels; recommendations of new standards and revision of old ones, were among the many subjects considered at the forty-second annual meeting of the American Society for Testing Materials in Atlantic City, N. J., June 27-30.

A number of the sessions conducted early in the week are reviewed on these pages, later sessions will be reported in the July 10 issue of STEEL. General features of the meeting are summarized on pages 18 and 19 of this issue.

Demand for metals having properties which make them suitable for use at subatmospheric temperatures is growing at a rapid pace. Within the field are oil refineries, aircraft, railroads and various chemical processes involving refrigeration. It is fairly well established that while the strength of metals usually increases at subatmospheric temperatures, toughness frequently falls off to the point where some metals become dangerously embrittled.

Need for Low Temperature Data

Particularly in the case of some steels, the structure imposed by heat treatment is often a vital factor in determining suitability of the metal to withstand stresses at low temperatures. For a given composition of metal there is sometimes a limit to the temperature to which it may be reduced safely in service and below which the metal is wholly unsuitable. While there is a considerable amount of information extant bearing on the behavior of metals at low temperatures, there is need for gathering together all the available knowledge for the benefit of engineers and metallurgists.

To initiate the assembly of this information and to indicate the gaps which exist was the purpose of a roundtable discussion organized by the joint A. S. M. E. and A. S. T. M. research committee on effect of temperature on properties of metals. N. L. Mochel, metallurgical engineer, Westinghouse Electric & Mfg. Co., Philadelphia, is chairman of this committee. The formal portion of the program consisted of two technical papers and four summaries of specific phases of the subject.

H. Habart and W. J. Herge, assistant metallurgist and special test supervisor, respectively, National Tube Co., Ellwood City, Pa., contributed a paper on subsize Charpy relationships at subzero temperatures. Impact tests were made on eight steels at 70 degrees Fahr. and subzero temperatures to 150 degrees Fahr. Standard and various subsize specimens were broken at each testing temperature.

In general, ferritic steels lost impact resistance, as measured on standard and two-thirds size specimens, when the testing temperature was decreased. One-half size specimens also lost impact resistance, but not to the marked degree as larger size specimens. Smaller specimens have practically constant impact resistance through the temperature range used.

An austenitic 18 per cent chromium, 8 per cent nickel alloy had increasing impact resistance with decreasing temperature, the authors reported.

Factors affecting notched-bar impact tests on steel at low temperatures were discussed in a paper by Walter Crafts and J. J. Egan, research metallurgists, Union Carbide & Carbon Research Laboratories Inc., Niagara Falls, N. Y. To determine the reasons for lack of correlation between different makes of Charpy and Izod-type impact testing machines in tests at the low temperatures, and to evaluate some of the variables that might produce the differences, was the purpose of the investigation.

Impact Machines Compared

Tests of both Izod and Charpy types were made on a machine in which the initial energy and velocity of blow could be varied independently. Notch radius and depth also were investigated to estimate sensitivity to accuracy of the specimen dimensions. Length of cantilever arm of an Izod machine was studied. Results indicated a general, but not extremely accurate, correlation between different makes of machine, and a conservative use of the test for specification purposes is recommended.

Introducing the roundtable portion of the session, F. B. Foley, superintendent of research, Midvale Co., Philadelphia, reviewed characteristics of various steels for low-temperature service. Indications are, he said, that some elements improve impact strength of steels in the subzero ranges, these elements being manganese, vanadium, nickel, chromium, molybdenum and copper.

Aircraft metals subject to subatmosphere temperatures were discussed briefly by H. J. Huester, materials engineer, bureau of aeronautics, United States navy, Washington.

A contribution by J. R. Freeman Jr., technical manager, American Brass Co., Waterbury, Conn., dealt with subatmospheric properties of copper and copper alloys. These alloys, he stated, have all their mechanical properties improved by low temperatures, thus they are well suited for this type of service. Cast alloys, it was pointed out, lose some of their ductility.

Considering nickel, monel and inconel, B. B. Morton, International Nickel Co. Inc., New York, said that these metals likewise show improved characteristics at the low temperatures.

Steel Mainly Affected

Mr. Foley remarked that in general the nonferrous alloys present no difficulties in the subatmospheric range of temperature, the problems occurring chiefly with steels. Col. G. F. Jenks, chief of technical staff, ordnance department, United States army, commented that the low-temperature behavior of metals does not enter much into ordnance work. He expressed the hope, however, that some investigator some day would find out what happens to the steel itself when subjected to the low temperatures.

P. E. McKinney, metallurgical engineer, Bethlehem Steel Co., Bethlehem, Pa., also asserted that it is desirable to start a complete correlation and compilation of information on low-temperature behavior of steels as a guide to the engineer. Another speaker referred to the experience of the oil industry, which a few years ago was suddenly confronted with the problem of constructing refinery equipment which would stand up in subzero temperatures. Starting almost from scratch, this industry found suitable steels and even fabricated them by welding. These practical engineering problems arise quickly and must be solved quickly; progress cannot wait for a collection of existing information.

Concluding discussion, H. J. French, in charge of alloy steel and iron development, International Nickel Co. Inc., New York, said in his opinion better impact values in ferritic steels at low temperatures could be attained if five factors were watched closely. These he enumerated as follows: (1) Use a low carbon content; (2) deoxidize carefully; (3) make a careful selection of alloy elements; (4) obtain structural refinement and homogeneity; and (5) provide freedom from internal stresses. Under these conditions, he believed good impact values can be secured at tempera-

tures as low as -150 to -200 degrees Fahr.

Four technical papers and four committee reports were presented at a session on iron. Mechanical properties of high-strength cast iron was the subject of one paper by J. O. Draffin and W. L. Collins, professor and associate, respectively, department of theoretical and applied mechanics, University of Illinois, Urbana, Ill. This contained results of tests which parallel closely similar tests on low-strength iron presented before the society during the past two years.

Among conclusions reached by the authors were: In tension and torsion, high-strength cast iron is similar in general action to low-strength cast iron; modulus of elasticity of the high-strength material is nearly the same in compression and bending and slightly less in tension; modulus of elasticity in shear is about 0.4 the value in tension and compression; modulus of rupture in bending is less for H-sections than for solid rectangular sections; and in a beam the neutral surface arises as the load is increased, the rise being greater in an H-beam than in a rectangular beam.

Oxidation Resistance Investigated

Results of an investigation to determine effect of various chromium contents on resistance of cast iron to oxidation were reported in a paper by C. O. Burgess, research metallurgist, Union Carbide & Carbon Research Laboratories Inc., Niagara Falls, N. Y. Eleven cast irons containing approximately 0 to 25 per cent chromium were employed and during 360-hour exposure periods were heated and cooled from test temperatures of 700, 800, 900 and 1000 degrees Cent. The data indicated the percentage of chromium necessary at each temperature level to limit the total oxidation of cast iron. Low carbon control specimens indicated that carbon content has relatively little effect on oxidation resistance.

Resistance of high-silicon malleable iron to drilling was considered in a paper contributed by H. A. Schwartz, manager of research, National Malleable & Steel Castings Co., Cleveland, and R. C. Kasper and N. E. Mertz, Case School of Applied Science, Cleveland. In a drilling test of malleable ranging from 2.09 to 2.36 per cent carbon and from 1.39 to 2.10 per cent silicon, it was found that both elements reduce resistance.

Relation of carbon nodule size and tensile properties of malleable cast iron was discussed in a second paper by Dr. Schwartz, and H. J. Schinder and J. F. Elliott, Case School of Applied Science, Cleveland, as coauthors. In the test, a given white cast iron was converted into malleable irons varying widely in nodule number. The test indicated a great variation in nodule number has little effect on tensile strength and yield strength, but that a small nodule number is favorable to ductility.

Wrought Iron Specifications

Report of committee A-2, presented by its chairman, C. B. Bryant, engineer of tests, Southern Railway System, Alexandria, Va., recommended adoption as standard of tentative specifications for wrought iron plates, lap welded and seamless steel and lap welded iron boiler tubes, wrought iron rivets and rivet rounds, and rolled wrought iron shapes and bars. It also recommended adoption as standard of tentative revisions of standards covering the following: Iron and steel chain welded wrought iron pipe, solid staybolt wrought iron, hollow rolled staybolt wrought iron, uncoated wrought iron sheets, galvanized wrought iron sheets, and wrought iron rolled or forged blooms for forging.

Committee A-3 report, submitted by Chairman W. H. Rother, metallurgist, Buffalo Foundry & Machine Co., Buffalo, recommended withdrawal of standard specifications for the arbitration test bar and tension test specimen for cast iron (A 124-29). Revised specifications for cast iron soil pipe and fittings will be presented to the society for action later in the year.

Report of committee A-7 on malleable iron castings, read by E. K. Smith, metallurgist, Electro Metallurgical Co., Detroit, its chairman, provided new tentative specifications for pearlitic malleable iron castings. The report also recommended that tentative specifications for cupola malleable iron (A 197-36) be adopted as standard and that standard specifications for malleable iron castings be continued without revision.

T. H. Wiggin, consulting engineer, New York, and chairman of sectional committee A-21 on specifications for cast iron pipe and special castings stated specifications for pit cast pipe and for mortar for pipe linings. This work is a project of the American Standards association.

Two destructive influences affecting metals, namely, fatigue and corrosion, were considered jointly at one of the most important sessions of the week. The fatigue portion of the session provided three technical papers and one committee report; the corrosion section two papers and three committee reports.

In many applications, serviceable life of wire is terminated by fatigue failure. Testing machines necessitating a machined specimen do not give a true index of the endurance properties of wire because the effect of surface conditions are removed. Working on this problem, C. P. Wampler, junior engineer, A. O. Smith Corp., Milwaukee, and N. J. Alleman, special research associate in engineering materials, University of Illinois, Urbana, Ill., contributed a joint paper presenting a method for testing straight wire with the original surface intact and sound.

Using a bridge wire and a low-carbon steel, the authors made tests on two types of machines and correlated the results. The rotating-strut machine offers a convenient and relatively inexpensive means of testing wire or rod in diameters from 1/16 to 3/16-inch without removing the original surfaces, it was stated. Comparable results obtained on the rotating-strut machine and the vibratory-type machine indicate that the methods of load application and stress calculation used for the rotating-strut machine are reliable.

Wire Surface Important

Surface condition of the wire tested had a pronounced influence in reducing fatigue strength below that found by testing specimens which had a carefully machined and polished surface, the authors stated.

That structures can be designed to withstand repeated loads, it would seem necessary to know the fatigue strength of the structural material used, actual stresses in the various parts of the structure under the service loads obtaining, and the number of repetitions of such loads during expected life of the structure, explained R. L. Templin, chief engineer of tests, Aluminum Co. of America, New Kensington, Pa. Three types of machines designed and used for four years in testing such structural units as joints, beams, columns and frames under normal working loads were described by Mr. Templin. Experience with these units indicates the feasibility and desirability of this type of testing.

A paper contributed by O. J. Horger and H. R. Neifert, in charge of railway engineering and research, and engineer, respectively, Timken Roller Bearing Co., Canton, O., constituted a progress report on the study of fatigue strength of the body section of railroad car axles. The axles are S. A. E. 1045 steel forgings machined to a tapered test section having a diameter of 6 to 7 inches and were tested by the rotating cantilever beam method. Specimens were tested in the as-forged condition without heat treatment but machined to a smooth turned surface.

The authors reported that while exceptionally few fatigue fractures occur in actual railroad service in the plain body sections of car axles, when pressed or clamped-on members are not applied, it is important to note from the tests that only 17,500 pounds per square inch is the endurance limit of the full-size axle

as compared to 33,000 pounds for that of the usual 0.3-inch diameter specimens machined from the surface of the full-size axle.

Although various explanations can be given as to the probable reasons for this large decrease in strength of the full-size axle, it is important, they said, that the designer take cognizance of this reduction when using an untreated and forged material in the machined condition.

Full-Size Test Specimens Desirable

Discussion indicated that testing of full-size specimens is highly desirable, but that few companies are able to do so either for lack of facilities or expense involved. Dr. F. N. Speller, advisory engineer, National Tube Co., Pittsburgh, asserted that it is well known that the effect of corrosion-fatigue is exaggerated when small-size specimens are tested, thus it would be interesting to see what results might be obtained when full-size specimens are used on large machines.

Report of the research committee on fatigue of metals, presented by its chairman, H. F. Moore, professor of engineering materials, University of Illinois, Urbana, Ill., reported progress on the investigation of the effect of type of testing machine on fatigue test results. Some delay has been experienced in getting a supply of uniform material for the tests.

The corrosion portion of the session was introduced with presentation of the report of committee A-5 on corrosion of iron and steel by its chairman, W. H. Finkeldey, Singmaster & Breyer, New York. The committee recommended the following new specifications and methods be accepted for publication as tentative:

Tentative specifications for zinc-coated steel wire strand (Class B and Class C coatings). These cover strand with heavier coatings than those called for in the standard specifications for zinc-coated (galvanized) iron or steel wire strand (cable) (A 122-33). Three wire strand and a fifth strength classification called "utilities grade" have been included.

Tentative methods of test for local thickness of electrodeposited coatings on steel. These methods include a microscopic method for determining the thickness of zinc, cadmium, copper, and nickel coatings on steel, and a hydrochloric acid spot test method for determining the thickness of chromium coatings. They will supply a method for determining compliance with coating thickness requirements of the tentative specifications for electrodeposited coatings of zinc on steel (A 164-35 T), cadmium on steel (A 166-35 T) for which there has been no A. S. T. M. method available.

Revisions were recommended in the following tentative standards: Electrodeposited coatings of zinc on steel (A 164-35 T); electrodeposited coatings of cadmium on steel (A 165-35 T); and electrodeposited coatings of nickel and chromium on steel (A 166-35 T).

The revisions include new material on sampling methods and on acceptance and rejection of material as a result of test, reference to the new tentative methods of test for local thickness of electrodeposited coatings on steel, and in the case of the third specification a change in the thickness requirement for chromium from average to minimum. In the three specifications the microscope method is recommended for determining the thickness of zinc, cadmium, copper, and nickel coatings, and the hydrochloric acid test for determining the thickness of chromium coatings.

A revision was recommended in the standard methods of determining weight and uniformity of coating on zinc coated (galvanized) iron or steel articles (A 90-33). This revision omits from the methods all reference to the Preece test as more up-to-date information has been incorporated in the methods of test for uniformity of coating by the Preece test (copper sulfate dip) on zinc-coated (galvanized) iron or steel wire (A 191-38) and on steel castings and forgings, gray iron and malleable iron castings (A 208-38 T).

Standards Recommended

Adoption of tentative standards as standards was recommended as follows: Zinc-coated (galvanized) iron or steel farm-field and railroad right-of-way wire fencing (A 116-37 T), to replace the present standard specifications (A 116-30); and zinc-coated (galvanized) iron or steel barbed wire (A 121-37 T), to replace the present standard specifications

The committee also recommended that the standard methods of determining weight of coating on tin, terne and lead-coated sheets (A 91-24) be withdrawn since these methods have become outmoded.

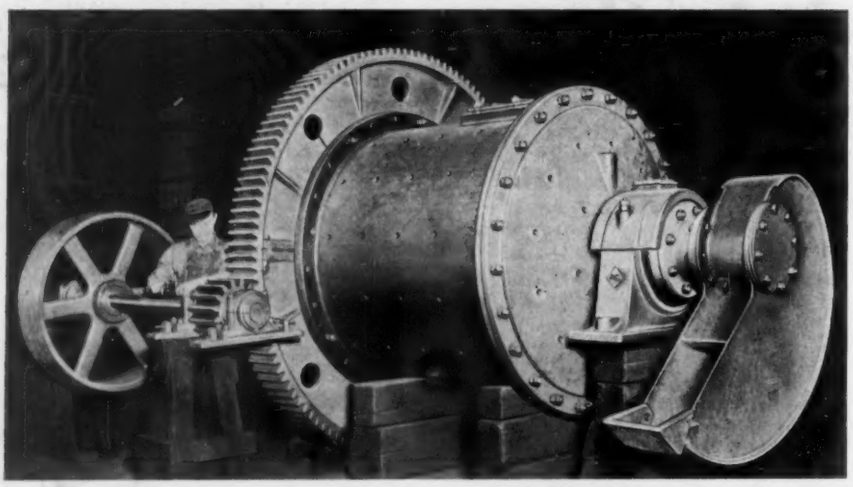
The meeting voted unanimously to approve the recommendations of the committee and to submit them to letter ballot.

Included in the report of committee A-5 was the final report of the wire test committee on characteristics of wire in field exposure test. The program was conducted under direction of the national bureau of standards.

Committee B-3 on corrosion of nonferrous metals and alloys, read by its chairman T. S. Fuller, engineer of materials, works laboratory, General Electric Co., Schenectady, N. Y., recommended for publication as tentative standard a proposed method of salt spray testing of nonferrous metals.

Appended to the report of this committee was a technical paper by E. A. Anderson and C. E. Reinhard, chief and investigator, respectively, metal section, research division, New Jersey Zinc Co., Palmerton, Pa., dealing with chemical removal of corrosion products in determination of the corrosion rate of zinc. The authors demonstrated that the commonly used method of determining the corrosion rate from the straight-line portion of a simple weight

Uses 3-Inch Manganese Liners



■ **This ball mill operates at 31 revolutions per minute, is driven by a 60-horsepower motor through a Texrope drive and countershaft. Manganese steel liners bolted to inside of the welded steel plate shell have an average thickness of 3 inches. Forged steel balls from 2 to 4 inches in diameter will reduce gold ore particles so 90 per cent will be less than 0.003-inch. Unit weighs 45,000 pounds, was built for a new Peruvian gold mine by Allis-Chalmers Mfg. Co., Milwaukee**

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From Raw Material Source to Finished Product . . .

A portion of the Hawkins ore mine, located in the Mesaba range.

to Take Care of Your Alloy and Carbon Steel and Pig Iron Requirements

Every step in the production of Wisconsin alloy and carbon steel and pig iron is carefully controlled to keep product-quality high. From the time the ore leaves our mines until the finished product leaves our mills at South Chicago the most thorough and up-to-date methods are used to insure uniform quality. Every operation is carried out with the customers' specific needs in mind.

We invite users of alloy and carbon steel and pig iron to write or phone us for complete information about our products.

WISCONSIN STEEL COMPANY
130 North Michigan Avenue Chicago, Illinois

Photo by Chicago Aerial Survey Co.

Above: The Wisconsin Steel Company plant from the air, a complete plant with facilities for every step in alloy and carbon steel and pig iron production. *Right:* Wisconsin Steel's three modern blast furnaces produce all grades of iron required by the foundry industry.

WISCONSIN

Alloy and Carbon Steel **Pig Iron**

change curve based on periodic weighings with the corrosion products in place will cause errors.

They cited data to illustrate the greater reliability of corrosion rate figures based on weight changes determined after chemical removal of the corrosion products. The same data showed the difference in corrosion rate of two rolled zinc materials during three separate 8-hour periods.

A paper by C. W. Borgmann, head, department of chemical engineering, University of Colorado, Boulder, Colo., critically reviewed the test results published to date by committee B-3 on atmospheric corrosion of nonferrous metals in nine different test locations. Results of the weight-change measurements and the descriptions of visual appearance were found to be of little use in forming a judgment regarding the relative corrosion resistance of the test materials. However, the author pointed out, the results of the tests on change in tensile strength and percentage elongation are considered to be of considerable importance to the engineering profession.

Report of joint committee on exposure tests of plating on nonferrous metals, of which William Blum, chemist, national bureau of standards, Washington, is chairman, was in the nature of a progress review, presenting a summary of inspections and conclusions to date of the tests of plating exposed at six test locations since 1936.

Rust Resistance Scale

Committee D-1 is considering a recommendation that a subcommittee be appointed to work on the preparation of a pictorial scale for evaluating rust resistance.

A session on water featured a paper reporting research performed by R. C. Corey and T. J. Finnegan, chemists, department of technical development and research, Consolidated Edison Co., of New York, Brooklyn, N. Y., to obtain experimental information regarding the fundamental corrosion reaction. This study was made of the reaction between iron and pure water at room temperature. The work was conducted in iron vessels, and the water used was free of dissolved oxygen and carbon dioxide. This procedure eliminated these gases as factors and also insured the absence of impurities that might be introduced by contact with glass vessels.

It was found by the authors that the solution reached a pH value approximately 8.3 and contained about 0.2 p. p. m. of dissolved iron. The solid product of the reaction is predominantly Fe_3O_4. Previous investigators have reported pH values of the order of 9.0 to 9.6, but it is believed that the use of glass vessels was responsible for higher results.

One session was devoted to coal, petroleum products and gaseous fuels. Subcommittee VIII of committee D-5 on coal has under consideration a revision of the standard specifications for foundry coke (D 17-16) based on tolerances for the variation of analyses which may be permitted from analytical values stated in any given purchase specifications.

The sectional committee on classification of coals, chairmaned by A. C. Fieldner, chief, technologic branch, bureau of mines, Washington, and functioning under the procedure of the American Standards association, recommended that the tentative definitions for varieties of bituminous and subbituminous coals (D 493-38 T) be approved for reference to letter ballot for adoption as standard. The committee further recommended that after adoption by A. S. T. M. these definitions be submitted to the Standards association for approval as American standard.

No tentative standards have as yet been promulgated by committee D-3 on gaseous fuels. This committee, also under chairmanship of Mr. Fieldner, made a progress report discussing considerations given to standardization of test methods. It included a resume of activities of the seven subcommittees on collection and on measurement of gaseous samples, on calorific value of gaseous fuels, on specific gravity and density, on determination of impurities, on water vapor content, and on analysis.

Depicts Progress In Steel Bridges

NEW YORK

■ JOHN A. ROEBLING'S SONS CO.'S exhibit in the Metals building at the World's fair has as its central motif an oil painting of the Golden Gate bridge, longest single span suspension bridge. Shown in suitable insets are small murals of earlier Roebling bridges.

In building the Golden Gate bridge the speed of spinning the wires was stepped up 600 per cent over that of any bridge cables previously erected, and a single span of 4200 feet was achieved. This shows the vast possibilities in future suspension bridges.

In front of the bridge picture is a diorama on which are miniature operating models of a dredge, a passenger tramway, a monocable tramway system, a mine hoist, a jig-back tramway, and an electrified railway system, all described by working drawings for those particularly interested in their operation.

The railing in front of the diorama consists of a 36-foot length of 5-inch wire rope. This rope was fabricated on one of the company's giant rope-closing machines. Although ropes of this size have never been made for use in the field, this was made to show the flexibility of its manufacturing facilities.

At either end of the diorama are samples of Roebling products, including a complete line of wire rope and fittings; electrical wires and cables, from hair-fine magnet wire to giant power cables; screen cloth for industrial and household uses, varying from extremely coarse mesh sizing and grading screens to fine mesh filter cloth. Also, there are several sample boards devoted to Roebling cold-rolled strip products; flat copper used in the making of electrical coils, air conditioning equipment, etc.; and high and low carbon strip, plain, tinned or galvanized, in a variety of tempers and finishes.

■ **Featuring John A. Roebling's Sons Co.'s World's fair exhibit is an oil painting of the Golden Gate bridge, accompanied by murals of earlier Roebling bridges. The railing shown is a 36-foot length of 5-inch wire rope, fabricated by one of company's giant wire-closing machines**

It takes 120 tons of water, 5 tons of air--ore, coal, limestone--and MEN to make a ton of Youngstown Steel

You hear a lot these days about the mechanization of industry. Youngstown has its share.... in the past 10 years we have invested $94,000,000 in new, improved equipment to assure improved, more accurate steel.

But steel is still a job for men, and men count more than mechanism in every ton of steel.

All the good men aren't in Youngstown plants of course, but we'll back our bunch against any crowd in any industry in the world. The way these furnace men watch heats as conscientiously as a doctor watches a thermometer.. ..the uncanny speed of operators in getting skelp out of the furnace so the weld will be complete and sound before a single inch of pipe gets a chance to cool....inspectors that are as careful of the final piece at the end of a day as of the first in the morning.... and those men on the cold mills who watch gauge needles as though their lives depended on it.

It's men like these that make us, in the sales department, proud to be able to offer you Youngstown steel. We don't say it's the only good steel in the world because there are other good men in our industry too. But we do say--and we'll back it with everything we've got--that there's no finer steel made anywhere.

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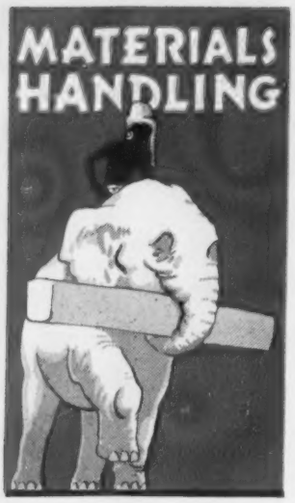
THE
YOUNGSTOWN
SHEET AND TUBE COMPANY
Manufacturers of Carbon and Alloy Steels
General Offices - YOUNGSTOWN, OHIO



Flexible Conveyor System

Conveyor setup in transformer test rooms allows shunting and return of units during lightning and conventional tests. Safety devices in lightning test room protect workers

By **ROY V. GAVERT**
Superintendent,
Transformer Division
Westinghouse Electric & Mfg. Co.,
Sharon, Pa.

■ IN ADDING a lightning surge-generator to the transformer test room it was necessary to provide a conveyor system of considerable flexibility to not only take care of transformers to be surge-tested, but also (without interrupting the production flow) those not requiring the surge test and those requiring a repeat test after the conventional electrical tests. In working with the high potential electricity in the lightning room it was also necessary to provide electric safety devices to automatically protect the workmen and systematize handling.

Assembled Transformers Tested

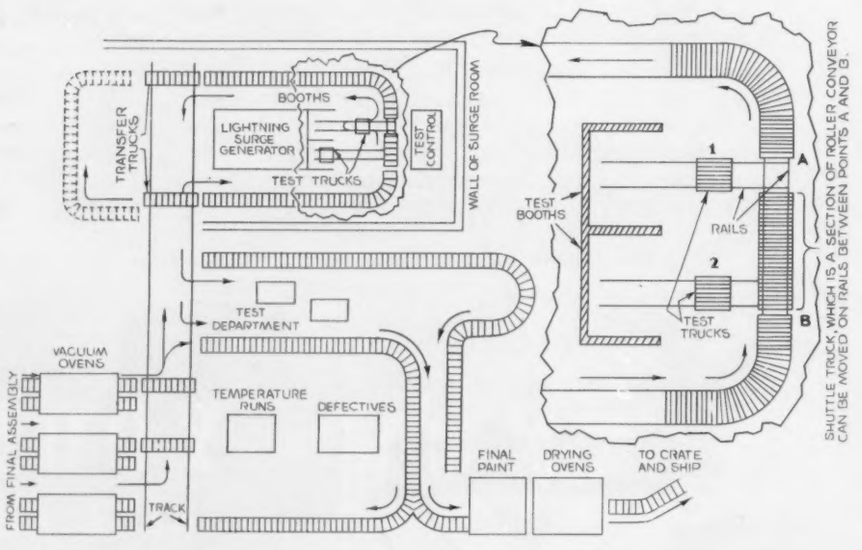
The conveyor through the lightning test room consists of a loop in the production line, installed immediately after the completely assembled transformers have had their final vacuum-furnace treatment and just before they pass to the conventional test department. It is essential to locate the surge test at this point in production line in order to give transformers the lightning test after all assembly work has been completed.

All transformers on this line emerge from a battery of three drying ovens on gravity, knee-high roller conveyors. They are pushed onto sections of roller conveyors on wheels, called transfer tables, which move on a track across the exit face of the furnace. A transfer truck with its load of eight or ten transformers can be pushed along the track and discharged either on the gravity conveyors making the loop through the surge test room or on conveyors leading through the conventional electrical test department. Continuing on roller conveyors out of test department, transformers can pass to final paint division or can be diverted on a conveyor for special attention or for a return trip through surge test room.

Surge Test In Separate Room

The lightning test is conducted in a separate room. The surge generator itself occupies the center of the room, with two test booths and control bench at far end of room. Two men, ordinarily, are required to make the tests, a test operator at the control desk and a workman to connect transformers and push them in and out of the two test booths. Three men are sometimes used to expedite production.

The transformer is pushed from the feeder roller conveyor onto a special test truck which fits into a gap in the conveyor in front of the test booth. Reference to the schematic diagram will show this gap in the conveyor is exactly the width of one test truck and can be made in conveyor in front of either booth by shutting back and forth, in line with conveyor proper, a section of the conveyor which is also mounted on rails. This arrangement makes it possible for transformers to be pushed over rolls for both loading and unloading instead of having to be lifted or pushed across face of rolls. Test truck rolls on track at a right angle to main conveyor. At back of truck is a vertical panel with short cables terminating in clamps for making quick connections to transformer terminals. Back of panel has prong-type contacts so that when the test



Schematic diagram of a portion of transformer production line showing lightning-test loop

ADVERTISING PAGES REMOVED

truck is pushed along its track into test booth, connections are automatically made to surge generator. With a transformer in place workman moves away from booth and steps on a switch, which makes it possible for test operator to proceed.

The only action required of test operator is to initiate the test and if necessary make any slight adjustment of power supply voltage. He turns a miniature switch and the remaining sequence of events is automatic, although operator can interrupt test at any instant. On moving the miniature switch a thick door is automatically lowered by a ceiling type hoist across front of the test booths, lightning generator begins to charge and test proceeds.

Test Runs Continuously

The surge-generator has two complete independent test booths and two identical test trucks. While a transformer is being tested in one booth the workman inspects last transformer tested and prepares a transformer on second truck for test. Thus when test on one unit is completed and door is lifted the workman pushes second test truck into its booth and withdraws the first one from its booth, permitting test to proceed immediately. In this manner the surge generator is kept in almost continuous service without being delayed for making of connections or any inspection work.

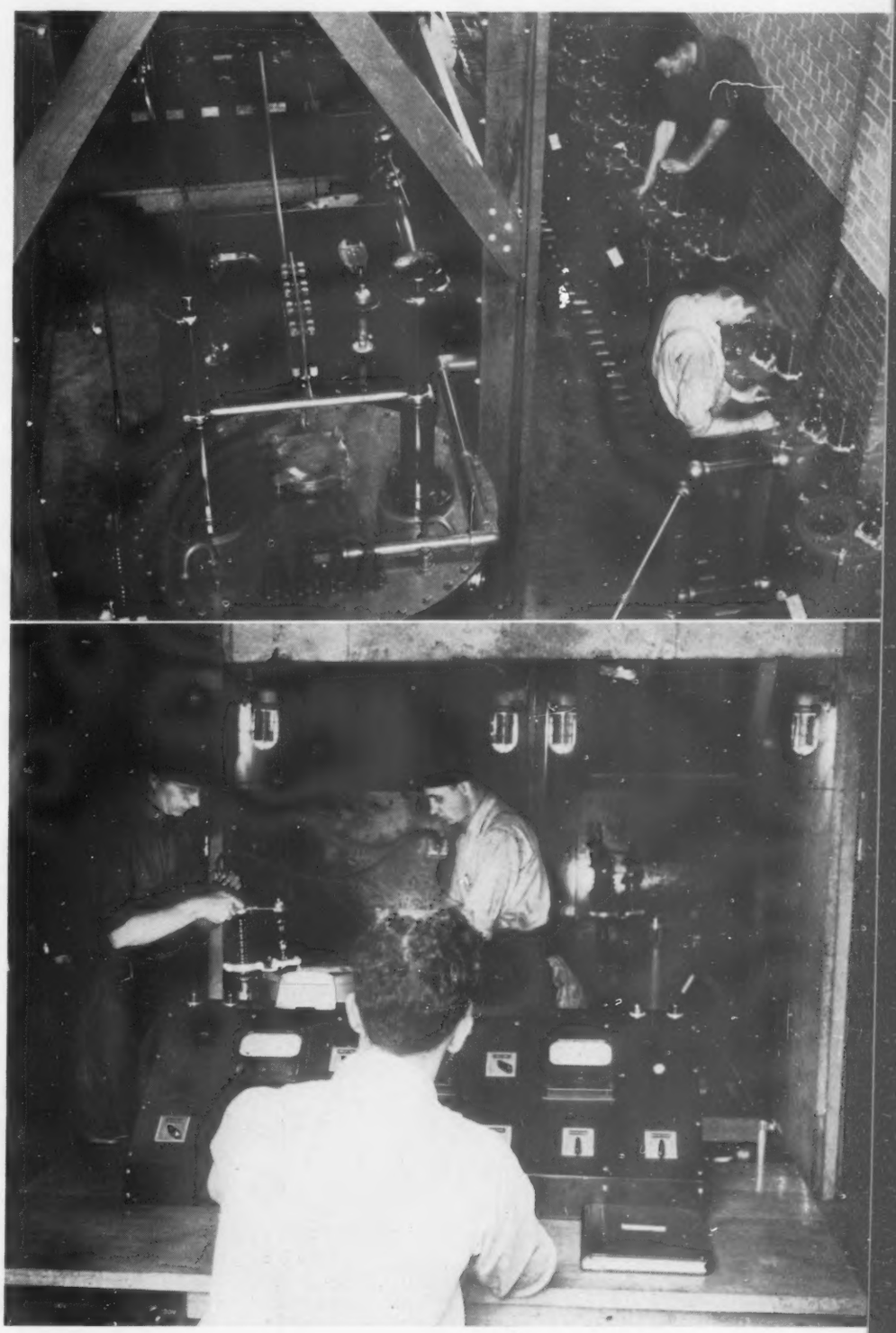
In each test booth there is a mirror placed at an angle so that test operator can look through a window in booth door down into transformer. He thus can watch each "shot" as fired and observe any abnormal reaction of transformer to any of the tests.

After the test, door is hoisted automatically and workman pulls truck from booth for inspection of transformer. After inspection, a gap is made in conveyor proper into which the test truck is pushed. The transformer then is pushed off test truck on to conveyor proper which goes back to the production aisle.

A complete set of safety measures surround every phase of the surge test. A combination of interlocks makes it virtually impossible for anyone—either regularly associated with the test or not—to place himself in a hazardous position with respect to any part of the apparatus. Should anyone attempt to enter surge test room from outside while a test is in operation a switch on the door (which is several steps away from fence surrounding generator) causes surge generator to be instantly de-energized and grounded. A steel fence separates surge generator and test area from transformer transfer area. The gate in this fence also has a switch which de-energizes the entire test equipment when gate is opened.

When workman has placed a unit in the test booth he must step back to a foot switch several feet away before test operator can lower door of booth. This insures that workman is not struck by the downcoming door. In addition, a magnetically operated plunger projecting across door guide can be withdrawn by test operator only when he and the workman are in their respective safe positions. This precaution prevents any failure of hoisting equipment from letting door drop with either of the testers

(*Please turn to Page 74*)



At top, transformers are being prepared for lightning test while on conveyor. At bottom are shown lightning test booths from operator's panel immediately before test on transformer in booth at right. Note transfer trucks run on rails and have terminal on side which will be in rear of booth

A BRAND NEW M.E. DEGREE

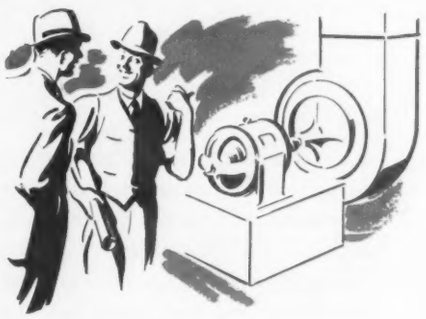
FAFNIR

Never Licked a Bearing Problem

With all due credit to the Class of '39, it takes more than a gown and mortar board to make a living solving the everyday problems of ball bearing application.

Recommend a bearing for a crusher installation in a cement mill! . . . for the shaft of a high-speed centerless grinder! . . . for the retractable wing tip floats of a big seaplane! *And don't make a mistake,* for ball bearings can be nearly as tough as diamonds when they're properly specified and applied; nearly as fragile as orchids when they're not. They're about as far from the "nut and bolt" class of parts as you can get.

That's why *practical experience* is so important a requirement of the Fafnir sales engineer. Take him as a group, and he's a junior Methuselah with 318 years of intensive field experience, able to hop a train toward any industry's pet problem and — from the time he arrives — make sound, helpful recommendations on the bearings that will solve it. Or



picture him in your mind as an individual typical of the group. You'll get a friendly, seasoned veteran with 13 years of ball bearing experience to his credit. No mere textbook engineer, but a man who has just washed the grease of the last job from his hands when he tackles yours. A specialist, he knows his end of the bearing business to a "T," just as his associates know theirs.

This experience of his is a fluid thing. He is constantly storing it up, constantly drawing upon it. And something more tangible than experience is stored up. For it is the Fafnir creed to make his new developments available — as soon as they are proved practical — in the widest possible range of new standard bearing types and sizes.

Have you a bearing problem? One that's been stubbornly recurring, or a brand new one brought about by a radical change in design? Don't call

it insoluble until your Fafnir sales engineer has tried his hand, with the most complete line of ball bearings in America to back him up. The Fafnir Bearing Company, New Britain, Conn.

BALANCE *In Range Of Products*

Fafnir production is not limited to a few types of bearings to the exclusion of others. Rather, the balanced line of Fafnir Ball Bearings includes every type and size of radial and thrust bearing, wide inner ring bearing and transmission unit to provide the most complete line in America.

Manufacturers who standardize on Fafnirs for original equipment or replacement enjoy the benefits that come with meeting every ball bearing demand from a single source of supply.

Ball Bearings

THE BALANCED LINE . . .
MOST COMPLETE IN AMERICA

Rolling-Mill Control

Of the three fundamental instruments—tachometer for speeds, pyrometer for temperature, wattmeter for work done—the new recording and remote indicating high-speed radiation pyrometers offer great possibilities. These units are so fast and sensitive as to record differences between ends and center of rapidly moving slabs

■ TWO FACTS are immediately outstanding in any consideration of modern rolling-mill control systems. Formerly the rolling of steel was almost entirely in the province of the mechanical engineer. In recent years it has swung around into the electrical engineer's domain since the electrical equipment forms a major item in total cost of a completed rolling mill. The rolling equipment itself was the primary consideration at first, and driving means were merely hooked on. Present mills employ layouts and a flow of material specially planned with the characteristics of the electrical equipment in mind.

A second outstanding consideration is the fact that modern high-speed continuous rolling mills would be an impossibility without modern instrument control. Instrumentation thus is a basic and inherent feature of the modern continuous mill.

There are a number of reasons for it. First, the modern mill represents a terrific concentration of power. Aggregate horsepower of only the main roll drives may be as much as 30,000 horsepower, all of which is controlled by only two to four men. To use such tremendous power effectively, the few men who control it must have a vast amount of information instantly available at their fingertips.

In this first of a series of articles on rolling mill instruments and control, STEEL briefly presents two principle points—first, the modern rolling mill as an electrical engineering problem and, second, the fundamental importance of instrumentation in the continuous mill. Appreciation of these factors is essential to understand the part played by individual measuring devices to be covered by subsequent articles

Possibly the second reason for the large number of instruments necessary is the use of rolling stands in tandem, where the material may be in several stands simultaneously. To make such an arrangement workable requires an extremely nice division of the load between different stands and proper proportioning of the elongation in each stand with the speed of the succeeding one. There is no time for guesswork or cut-and-try while material is going through stands at the terrific pace of modern rolling mills.

Instant Indication Necessary

Extremely high speed of these mills, running up to 2300 feet per minute with higher speeds contemplated, means that major adjustments must be made in advance. Also, any abnormality must be indicated instantly so it can be corrected or the mill shut down before damage occurs.

The fourth items that brings instrumentation to the fore is the increasingly rigid requirements as regards quality of finished product.

An appreciation of these two fundamental points (modern steel mill

Fig. 1—Electric tachometer, center, for measuring speeds accurately. Recorder at left and indicator at right record and indicate speeds at remote points. Photo courtesy Esterline-Angus Co., Indianapolis

as an electrical engineering problem, and the fundamental importance of instrumentation in the continuous mill) is necessary to understand the part played by each individual measuring device.

What are the particular instruments and applications so important in the modern rolling mill? In the first place, modern electrically driven mills universally use a pair of electrical instruments permanently connected to each rolling stand. One of these is a wattmeter and the other a speed recorder. The first shows actual amount of power being consumed in the rolling stand and thus the amount of work being done on the material passing through. The other shows speed or rotation of the rolls, or corresponding lineal speed of strip, sheet, bar or rod.

A wattmeter is valuable in setting up the roll initially or in checking its condition whenever rolls are changed. By measuring idle power and comparing it to a minimum value carefully established when the mill was first put into use, a check is provided on each roll changed.

Instruments Check Performance

The combination of wattmeter and speed recorder is particularly important on tandem stands of continuous mills to proportion the load between the different stands of the mill and to adjust in advance the speed of each stand. It is common practice to use both indicating and recording instruments; sometimes two sets of indicating instruments may be employed. Usually there is one set of indicating instruments alongside the rolling stand itself for the benefit of the operators there and a second set of indicating instruments, usually of the miniature type, in the roller's pulpit. Then there may be a set of recording instruments back in the motor room. Sometimes recording instruments are placed on the rear wall of the roller's pulpit so he cannot only see what is going on at the instant, but can see what changes have occurred during a particular period of time. Thus he can watch reduction in idling power as the mill warms up or can note increases in power due to misalignment, changes in delivery speed, etc.

Information which recording instruments give is of value not only in comparing actual operations of the mill but serves as a check on design and functioning of equipment and so aids in planning new mills and in deciding whether heavier work can be done on a given mill. It also permits a check on adequacy of substations, transmission lines and other vital points of power supply.

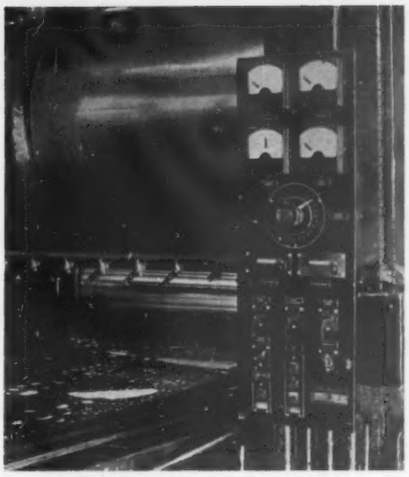


Fig. 2—Electrical instruments and switches at the mill stand emphasize the swing to electrical equipment in rolling mills. Photo courtesy Leeds & Northrup Co., Philadelphia

Thus records of these two instruments, power and speed, show performance both of equipment and handling which was given it by the men and so affords a clue to quality which is useful in projecting new designs and in determining how to operate the mill as economically as possible.

Possibly the instrument next in importance to the efficient operation of continuous hot mills is the modern high-speed radiation pyrometer which sights directly on slabs, on continuous sheet or strip, or on cut-off sheets as they move rapidly down the line. Such instruments continuously indicate and record temperature of the work wherever desired. Until just a few years ago, such measurements were impossible since it was necessary actually to contact the hot body. If an optical method was used, the equipment had to be balanced manually. Now instruments are available in a number of types which do this automatically and at such high rate of speed that variations in temperature of a rapidly moving strip can be measured. It is even possible to record the changes in temperature along the length of a slab as it passes rapidly in continuous motion under the measuring instrument.

Such temperature-measuring instruments are particulally important in two connections: First, to see that the initial temperature of a slab entering the continuous mill is high enough so it can be worked without undue strain on the equipment. Second, they permit checking temperatures in the latter stages of rolling to give correct delivery temperature, upon which the grain structure and surface finish of the product depend. Most continuous mills now have a delay table between roughing stands and finishing stands where the partially rolled slab is held until its temperature reaches the proper point for finish rolling.

Records Gage

In cold mills there are two instruments of extreme importance. These are the continuous indicating and recording thickness gage, or flying micrometer, and the tensiometer which measures tension in the strip. Both these instruments depend upon converting a mechanical measurement into an electrical one and indicating and recording such measurements on electric instruments.

A continuous thickness gage helps in holding the strip to the proper gage within the extremely narrow provinces now permitted while roll-

Fig. 3—Electronic Instagraph measures rolling mill temperatures by sighting on work. Thermo-photronic tube, center; potentiometer amplifier, left; recorder at right. Photo courtesy Bristol Co., Waterbury, Conn.

ing at high speed. It also helps to keep the strip of uniform thickness from side to side and to maintain the two sides of the strip uniform, compensating for wear on the rolls, inaccuracies in roll design, etc.

The tensiometer is important in cold rolling since such work is usually done under tension to obtain the desired grain structure and surface finish. The tension may be measured in various ways, but the tensiometer usually makes its measurement by having a roller ride on the strip in such a position that it is elevated slightly above the normal pass line. By measuring the downward force exerted on this roller, an indication is given of tension between the stands. This downward force is usually measured in terms of displacement, the roller being supported by cantilever springs and the displacement converted into electrical quantities by means of a magnetic bridge having a movable armature. (The same system is used in the micrometer, the sheet separating two jaws, one of which connects to the armature of a magnetic bridge arrangement.)

Another method of measuring tension applicable in certain cases is by determining power applied to the reel motor which pulls the stock through the final rolling stand. Tension on the in-going side of the strip may be measured by determining power supplied in a reverse direction to the supply reel, or by the power absorbed in dynamic braking on this motor. Both methods are used in some mills. Here again mechanical quantities are measured by electrical means, the actual instrument being a simple wattmeter or ammeter.

Records Roll Pressure

While the radiation or direct-sighting pyrometer is most commonly used on hot mills it can be used to measure some temperatures considerably below red heat, and flying micrometers and tensiometers to cold mills, there is another instrument applicable to both. This is the roll pressure recorder which measures and records actual force exerted by the rolls on the stock passing through. Several types of instruments are available. While detailed methods of operation are different, operation usually depends upon measuring small dimension changes by the same induction bridge method already mentioned. This permits conversion of these small mechanical motions into electrical quantities which may be indicated and recorded at remote points.

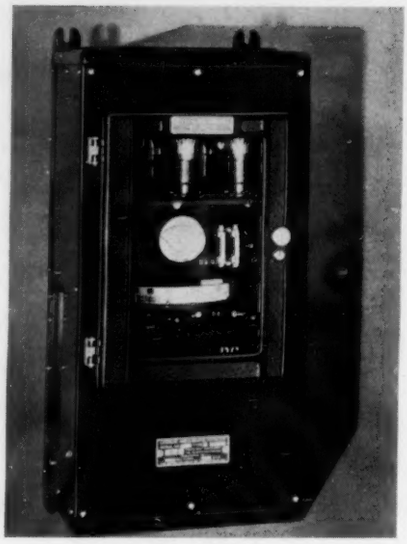


Fig. 5—This telemeter makes continuous measurements at one point and indicates or records these measurements at distant points. It also permits totalizing measurements made at various points. Photo courtesy Esterline-Angus Co., Indianapolis

One system employs a measuring unit inside the mill housing to measure the amount of stretch of a portion of that housing over a selected length. This change in dimension moves the armature of the magnetic bridge to operate the necessary instruments. This method requires calibration after installation in the completed mill. This is usually done by a hydraulic jack.

In another system a pressure block is installed under the screwdown mechanism. This block is a simple short cylinder of steel subjected to direct compression. The measurement made is amount of increase in the circumference of this block. Such blocks can be calibrated in large dead weight testers, and so it is possible to have the instrument calibrated before it is inserted in a mill, thus permitting precalibration of the mill itself. With either type of instrument, standard practice employs an indicating instrument in view of the operator at the mill and recording instruments in the roller's pulpit.

Such load pressure recorder systems are extremely valuable. They permit working the mill up to its maximum capacity without causing breakage of rollnecks or damage to rollneck bearings. Also they avoid damage to screwdown mechanisms and galling or rolled surfaces. At the same time, they permit operating with the particular load for which the curvature of the roll was designed, thus assuring a sheet whose thickness is uniform from side to side.

They also act as an independent check on rolling temperatures, particularly valuable where recording optical pyrometers are not used. The temperature can be checked by this method because for a given amount of reduction, the actual thrust between the rolls will vary rapidly with changing temperature of material in the hot mills.

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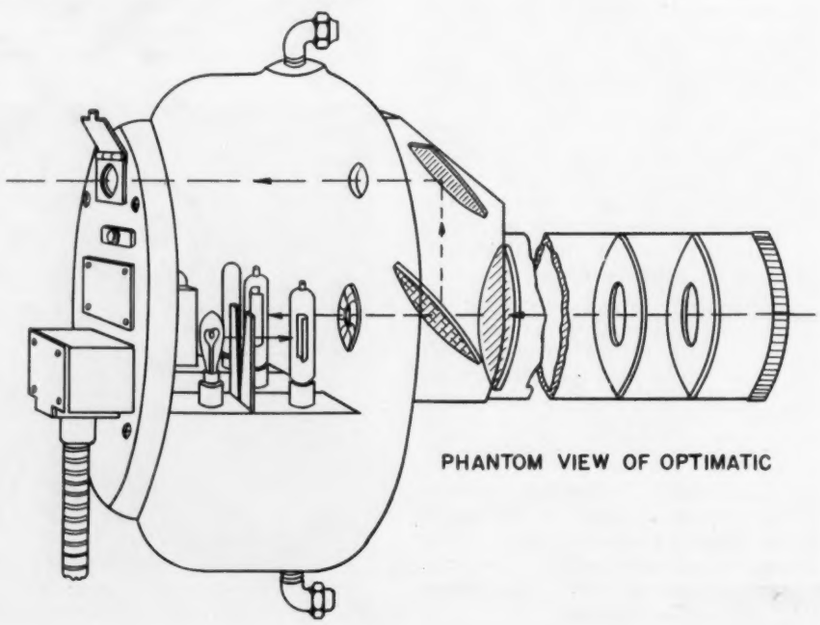
■ Duotone, a baking metal finishing material developed by Glidden Co., Cleveland, produces a uniform two-tone effect in one spray application, is unaffected by varying oven conditions and is available in a wide variety of colors.



PHANTOM VIEW OF OPTIMATIC

Fig. 4—Phantom view of high-speed optical pyrometer with automatic self-balancing optical system. Drawing courtesy Brown Instrument Co., Philadelphia

ADVERTISING PAGES REMOVED

Electroplaters Discuss Latest Developments Affecting Coatings

■ The problem of selecting the proper method for applying lacquers is by no means simple; it involves such variables as handling methods, the labor that is available, type of product, quality of finish and volume of production, according to Dr. Gustave Klinkenstein, vice president and technical director, Maas & Waldstein Co., Newark, N. J., before the twenty-seventh annual convention and the second international conference of the American Electro-Platers' society at Asbury Park, N. J., June 19-22.

For an earlier report on proceedings at this meeting please see Steel of June 26, p. 57.

Dr. Klinkenstein advised application by brushing for small runs where cost of expensive equipment is not justified. Brushing often may be applied to quantity production economically where the article is comparatively simple. The roller-coating method is one of the least expensive and excellent where applied to flat products. Coverage per gallon is greater than for other methods and it is easier to control thickness, he said. Principal users are the can and sign industries. Cylindrical products, such as flashlight cases, may be roller-coated automatically.

Tumbler, Centrifuge Used

In the tumbling process, the products are finished by rolling 15 to 30 minutes in a barrel designed for the purpose, in the presence of a small amount of coating. Subsequently they are air-dried on a screen. This method is well adapted for light, small objects. The centrifugal method is one of the most economical for mass production if the cost of the equipment is justified, he said. The basket containing the articles to be finished is lowered from the upper part of the machine into the agent, returned to its former position and spun at high speed. Then, the articles are air-dried or baked. The method is well adapted to light castings and small stampings. Automobile wheels are being finished individually by this method.

Hand dipping is one of the oldest methods, being simple and low-cost, he said. Open tanks, however, sometimes permit the finishing material to become contaminated. Solvents also evaporate. Machine dipping may be applied to practically all products except those with large, flat surfaces and those to be finished only on one side. Operation is by hydraulic or electric power with manual or automatic controls, often being equipped with conveyors. In one machine the lacquer tank is raised and lowered. The gasket method is used where the products are of uniform cross section, such as wire. After dipping, the excess lacquer is wiped off. Dr. Klinkenstein said that about 75 per cent of all industrial finishes are applied with spray guns, especially since the initial equipment cost is small. Various crinkle and other special finishes generally may be applied only by spraying. Automatic spraying is applicable where a large number of products with uniform contours are involved, such as steel barrels, refrigerator panels, and the like.

Material In Central Tank

A new development, he said, is the circulating system whereby each finish is stored in a central tank and piped to each operator. The operator may simply attach his spray equipment to the proper outlet. A more recent development is the use of hot finishes applied with special guns. The heat, usually 150 to 160 degrees Fahr., reduces viscosity and permits use of finishes with higher solid content, the increase being 25 to 60 per cent. One hot coat often is equivalent to two cold coats, he said.

Recent trend toward higher current densities in plating has resulted in closer study of agitation, Donald Wood, Reed & Barton, Taunton, Mass., told members of the society. No set rules have been set up pertaining to agitation, since it sometimes means movement of the cathode and in other instances motion of the solution. Agitation reduces cathode polarization and is used effectively for this purpose. In the discussion, it was brought out that the bath tends to become uneven, being concentrated at the anode and less concentrated at the cathode. It also was said the degree or type of agitation is uncertain. In general, however, the amount of agitation depends upon the results desired.

Considerable stress has been placed on specifications for thickness of coatings, Frank C. Mesle, Oneida Ltd., New York, said, and equal importance should be attributed to adhesion of coatings. Mr. Mesle noted that 52 automobile bumpers examined showed that coatings on 29 of these adhered poorly and thus offered little protection. He advised the development of specifications for adherence to prevent failures from this cause.

Mr. Mesle has developed a gage for testing adhesion consisting principally of a slotted, ¼-inch drill rod with a spring. With this instrument he has been able to determine relative adherence of various coatings. He found that heating generally increased adherence. Also, he found that perfectly adherent coatings may be applied to highly finished surfaces, which is somewhat contrary to the theory that the surface must be roughened to provide a mechanical bond.

In discussing layouts for plating plants, D. R. Hartshorn Jr., Westinghouse Electric & Mfg. Co., Springfield, Mass., declared that electrical distribution losses may run as high as 50 per cent due to inefficient setups. He suggested that often a number of small generators are more efficient than a large single unit although first cost is greater. Automatic equipment is justified only where a large volume of work, uniform in character, is involved. Often, plant layouts may be improved materially in efficiency by simply rearranging equipment, he said. In further discussing equipment, he pointed out that rectifiers have been coming into more general use recently.

Dr. C. B. F. Young, New York, discussed "The Effect of Certain Wetting Agents Upon Nickel Deposits." A wetting agent may be defined as any material which will lower the surface tension of the solution, he said. The various commercial wetting agents are more than wetting agents, he said. For instance, he found that it is possible to produce bright deposits through the use of proper amounts of these agents. He also found variations were possible in crystalline structure of the coatings. Change in pH, hydrogen-ion concentration, seemed to have little effect on their efficiency. Dr. Young suggested further investigations of these agents, pointing out that there are many applications not generally known today.

Plating Standards Under Way

Dr. William Blum, national bureau of standards, Washington, said that a definite move is under way toward the development of standards for plating. Considerable work also is being done on alloy deposition and he expressed the hope that more light will be cast on the problems involved.

Dr. Blum also presented P. W. C. Strausser's paper on "Porosity Tests for Nickel Coatings on Steel". Until recently, Mr. Strausser was associated with the bureau of standards as research associate for the plating society. Porosity tests are none

too definite, according to Mr. Strausser, and the ultimate answer lies in the way the coating stands up in service. However, accelerated tests are excellent, such as the application of sodium chloride, he said. The English hot water test also is fairly reliable. This involves dipping the samples in water just below the boiling point for about six hours.

Some porosity tests have been made with iodine solutions; these indicated the existence of other materials in the pores which plug them up. No definite findings yet have been made. It was pointed out in the paper that it is difficult to secure standard comparisons so as to determine whether a test is entirely accurate.

Dr. Blum also presented a paper on "The Measurement of pH in Alkaline Plating Solutions" by M. R. Thompson, chemist, national bureau of standards. Mr. Thompson found that, in using indicators, it is necessary to add about 1 to 1.5 pH units to obtain the true rating. Glass electrodes only may be used in alkaline solutions and inasmuch as these are affected by the solution, corrections must be made. In any event, accurate measurement of pH is a difficult problem.

Drop Tests on Coatings

A. Brenner, bureau of standards, presented a discussion on "Dropping Tests for Zinc and Cadmium on Steel". In making such tests, various reagents are dropped through a capillary tube upon the sample arranged at an angle of 45 degrees at the rate of about 100 drops per minute. The rate of penetration of various coatings thus may be determined very readily. Type of reagent depends upon the coating. Ammonium nitrate did not work out well in several cases as a reagent for zinc and cadmium. Addition of ferrocyanide increased the error. Chromic acid proved satisfactory.

"Some Effects of Anode Shape and Position on Cathode Current Distribution" were discussed by C. Kasper, national bureau of standards. He pointed out that the effect of anode shape disappears very rapidly and that 65 per cent of the current comes from 10 per cent of the anode nearest the cathode.

Silver Coated Containers

A. J. Dornblatt, senior research associate, bureau of standards, presented a paper on "A Study of Silver Plating for Industrial Applications" prepared by C. S. Lowe and A. C. Simon of the bureau. The research is sponsored by American silver producers who believe a large market exists for silver-coated containers. Returnable containers are expected to provide an important outlet though first cost is high. Nonreturnable containers, such as barrels, also are expected to have a bright future. At present, a 12-ounce can may be coated adequately at a cost of one cent. The most economical method appears to be the application of a copper undercoat, nickel strike and finally a silver coating.

Experiments have shown that, by using a copper undercoating, very much less silver is required to reduce porosity. Nickel also has a pronounced effect on porosity. Silver coatings only 0.00001 to 0.00002-inch thick appear to have very definite possibilities for nonreturnable containers, such as for food products.

Dr. Frank C. Mathers, professor of electro-chemistry, University of Indiana, Bloomington, Ind., discussed the complex character of plating baths. Even water itself, he declared, displays varying characteristics, depending on the salts present. Ions are extremely complex and carry varying amounts of water and have important effects on metallic deposits. He pointed out that deposits are affected by everything in the bath, a feature not generally recognized. Accumulations of certain compositions often affect coatings adversely. In discussion it was brought out that each metal is a law unto itself, so that it is impossible to set up any general rules pertaining to bath additions.

George B. Hogaboom, Hanson-Van Winkle-Munning Co., Matawan, N. J., headed the educational committee which arranged the excellent program of technical program. Additional features included visits to the Hanson-Van Winkle-Munning Co. plant, as well as the copper works of Anaconda Copper Mining Co. at Perth Amboy, N. J.

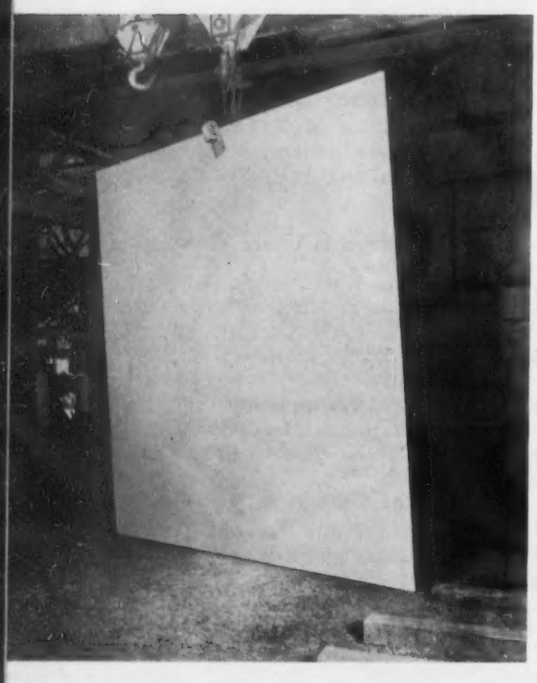
New officers of the society for the coming year are: President, R. M. Goodsell, Racine Plating Co., Racine, Wis.; first vice president, Frederick Fulforth, The Proctor Electric Co., Philadelphia; second vice president, Joseph L. Downs, Remington-Rand Inc., Middletown, Conn.; third vice president, Nelson Sievring, Philip Sievring Co., New York.

♦

Cellophane Marker Tape

■ Experiments with cellophane marker tapes for identifying cables and wires indicate that advantages may be derived from their use, according to an announcement by E. I. du Pont de Nemours & Co. Inc., Wilmington, Del. Experiments were made to establish positive identification in cables and wires both in the electrical and wire rope fields. Tests were made to establish definite conductor identification in electrical cables or wires constructed of two or more conductors and to register actual manufacturer identification and coding of various types of wire rope.

Advantages claimed for tape are: It can be cleaned using solvents of insulating materials and does not lose its color; data can be printed in small type; tape can be folded on itself, completely protecting the printing against impregnating compounds; tape is thin and flexible and also will improve the dielectric value of insulation.



Clad Steel Plates Are 151 Inches Wide

■ Two unusually wide nickel-clad steel plates recently were rolled by Lukens Steel Co., Coatesville, Pa., on its 206-inch plate rolling mill. Measuring 152 inches long, 151 inches wide and 0.75-inch thick, each of these plates weighed 5315 pounds. Coating was 0.075-inch thick. Their large size permitted construction of a chemical vessel with only two longitudinal joints and no circumferential joints except those joining heads to the shell

Stressproof News

T. M. REG. U. S. PAT. OFF.

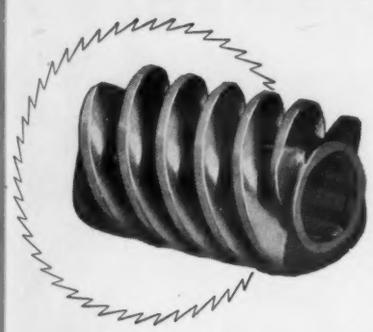
EXTRA Stressproof No. 2 possesses high strength and unique wearing qualities *right in the bar*, and, therefore, requires no heat treating or carburizing! It is manufactured by La Salle Steel Co. exclusively.

Presenting News of a New Bar Steel • Featuring Strength, Wearability, Non-Warpage, Machinability

VOL. 1 No. 1 — *Published Periodically By* LA SALLE STEEL COMPANY — Chicago, Ill.

CASE CARBURIZING ELIMINATED! TESTS PROVE NEW STEEL'S WEARABILITY

Replaces Expensive Alloy—Increases Machining Rate—Lowers Material Costs



A group of manufacturers facing the problem of producing wear-resisting parts at lowest cost found the answer in Stressproof. Tests conducted in their own shops showed that Stressproof No. 2 possesses unusual wearability *right in the bar itself*. This completely eliminated the necessity of case carburizing on such parts.

Representative of many similar small parts is the hollow worm for the portable electric Skilsaw. Stressproof No. 2 replaced Case Carburized SAE 4615 . . . and after an extremely severe test during which the shaft transmitted 1½ H. P. at 8000 R.P.M., the testing engineer reported that the Stressproof worm showed no apparent wear or sign of use.

Through the elimination of the case hardening operation, the worms could be produced to closer tolerances. Previous difficulties experienced in the worm made from carburized alloy, such as warpage and shrinkage in the internal diameter, were entirely eliminated.

Such elimination of carburizing, cleaning, grinding, straightening, and improved machinability obtained by the use of Stressproof No. 2 has cut costs as much as 31c each on worm gears like this in the portable tool, stoker, washing machine, and similar fields.

In the part shown here, the use of Stressproof No. 2 also increased machine rates about 35% with a corresponding increase in tool life and considerably reduced material costs.

Stressproof No. 2 by reason of its unique wear qualities can be substituted for case carburized steel in many applications. It should be noted, however, that Stressproof No. 2 has a Yield Strength of 100,000-lbs. psi minimum, and, therefore, is not suitable for parts case carburized and subjected to higher unit pressures and severe Brinelling action.

ELIMINATES 3 STRAIGHTENING OPERATIONS ON 18" RACK

Costs Cut After Switch from Cold Drawn Bars to Stressproof No. 2

A well-known manufacturer has found the solution to a troublesome situation in the production of an 18" rack. The use of Stressproof Steel in place of cold drawn bars was the answer to this company's problem. Stressproof's surprising ability to resist deformation, *eliminated completely several straightening operations*. Obviously, the elimination of extra work saves time and cuts production costs.

With the steel formerly used for the manufacture of the rack, excessive warpage after machining occurred. Broaching of the part in the 4" areas caused run-outs of as much as ¼", requiring several straightening operations.

After switching from cold drawn bars to Stressproof No. 2, broaching was done smoothly and neatly and no straightening after broaching was necessary.

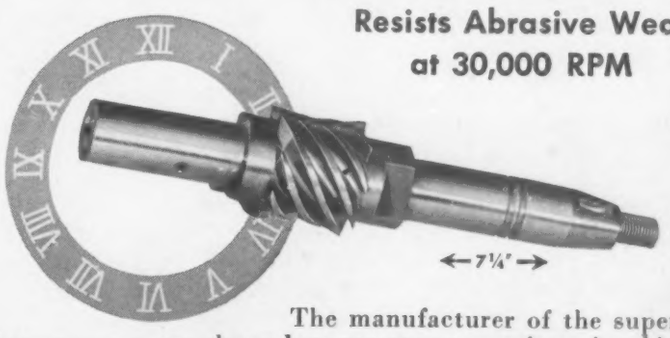
According to this manufacturer, machining does not cause in Stressproof the warpage which calls for expensive straightening operations. He rates it as the ideal steel for parts requiring keyseating, splining, stepdown forming, and threading—such as high strength shafts, spindles, and similar parts.

Stressproof Steel Ideal for Lead Screws

The combination of wearability with resistance to warping (and run-outs), have given Stressproof Steel popular application in the manufacture of lead screws. One manufacturer reports a total variance of lead of only .0004" in a screw machined from Ground Stressproof No. 2.

SOLVES DIFFICULT MACHINING PROBLEMS BY REPLACING HEAT TREATED SAE 3140

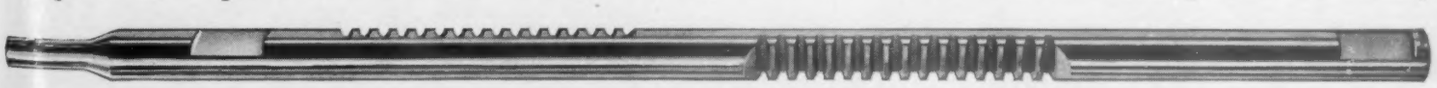
Resists Abrasive Wear at 30,000 RPM



The manufacturer of the supercharger cone worm shown here reports an experience in which a new high degree of machinability proved to be a vital factor in solving his problem. The steel formerly used was heat treated SAE 3140, and it cut slowly and warped after machining, which resulted in a high percentage of noisy gears.

The producer faced the task of finding a steel that would machine well, and still give him sufficient wearability, strength and non-warpage. It was not until he tried Stressproof No. 2 a year ago that he found the answer to his problem. Machining speeds were stepped up from 30-40%, much greater accuracies were held, the finish was greatly improved, and all warpage and chattering of the part was eliminated. A recent check-up of a 3-months' production run showed that only 3 machined worms had been rejected.

Furthermore, Stressproof's surprising ability to stand up in service without furnace treatment was again demonstrated by



(*Continued from Page 1, Col. 2*)

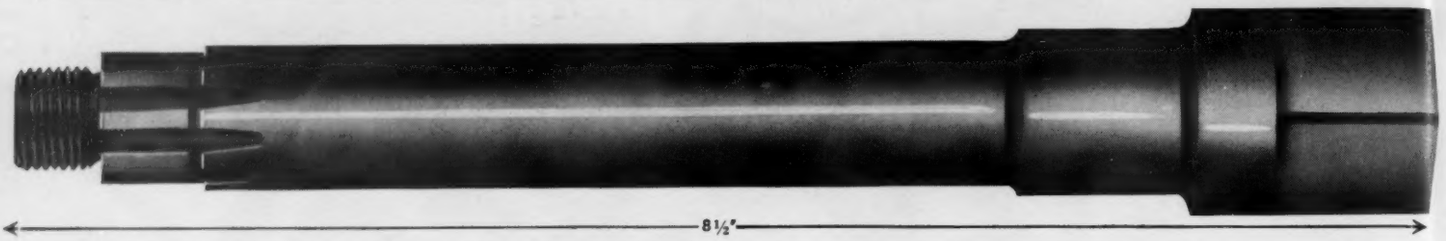
this company's severe test. Stressproof successfully withstood the sliding frictional wear in this application when running at six times engine speed and transmitting a load of approximately 12 H. P. at 30,000 R.P.M. Eight months' service in the field since then has confirmed desirability of Stressproof No. 2.

In other applications of this cone type worm, the elimination of either heat treatment or carburizing assures true tooth form and spacing by the elimination of all warpage.

transmission shaft—the saving resulted from the elimination of furnace treatment and subsequent operations. As Stressproof No. 2 possesses high strengths and unique wearing qualities *right in the bar*, no treatment is necessary.

The maker of this stoker shaft replaced SAE 1045, heat treated after machining, with Stressproof No. 2, eliminated all heat treating, increased his machining rates and eliminated his rejections due to warpage.

Stressproof No. 2 machines approximately 80% as fast as SAE 1112, possesses minimum yield point of 100,000 lbs. per sq. in., will not warp after machining, and its performance in service indicates that it will wear remarkably well.



SAVINGS UP TO 6c PER SHAFT MADE BY USE OF STRESSPROOF NO. 2

In-the-Bar Strengths Eliminates All Heat Treating — Replaces SAE 1045

Net savings of as much as 6c per shaft, equivalent to $118.00 per ton of steel, are currently reported on such parts as stoker transmission shafts, generator shafts, speed reducer shafts, and motor shafts by the use of Stressproof No. 2.

In many cases—like the one illustrated here of the stoker

These unusual qualities have meant savings of hundreds of dollars in many plants and have enabled manufacturers to replace carbon and alloy steels, both cold drawn and heat treated, and in some instances, even case carburized steels, with Stressproof No. 2 at important savings.

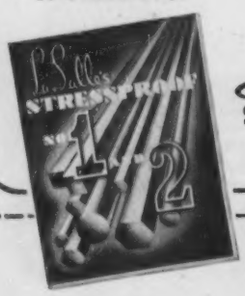
Use Stressproof Bars To

MEET COMPETITION

Every engineering property of Stressproof Steel can be turned to competitive advantage, enabling you to make your parts for less cost than when you use many of the other steels. For assistance in realizing the fullest savings, La Salle Steel Company offers the services of its Metallurgical Engineering Staff. Write to them regarding any problem you may have.

Send the coupon below for the Stressproof Bulletin giving comparative cost data on many cases like those quoted here.

WRITE FOR THIS BULLETIN ON THE PROPERTIES OF STRESSPROOF



La Salle
STEEL COMPANY
Manufacturers of the most complete line of cold finished steel bars in America

La Salle Steel Company,
P. O. Box 6800-A,
Dept. 7-A.
Chicago, Illinois

Please send your Bulletin of Stressproof Comparative Cost Data.

☐ Have a representative call.

Name_____ Position_____

Address_____

City_____ State_____

ANOTHER NEW LA SALLE STEEL

La-Led 1020-90 Provides Faster Machinability

In La-Led 1020-90 La Salle Steel Company offers manufacturers of steel parts for the first time the best non-alloy carburizing steel with fast machinability at a price lower than that of any other high quality carburizing steel.

The combination of freer machinability and maximum carburizing qualities results from the addition of lead to regular La Salle 1020-90 (to produce La-Led 1020-90).

How La-Led 1020-90 helps cut shop costs of manufacturers who can use its increased machinability is shown in this typical report: Production of gear blanks was stepped up from 92 to 150 pieces per hour, an increase of 62%, by a maker of gear blanks who substituted La-Led 1020-90 for non-leaded 1020-90.

La-Led 1020-90 is ideal for piston pins, spline shafts, case hardened gears (non-alloy) and intricate machining parts having requirements of dependable uniform physical values. For many such parts La-Led 1020-90 is superior to SAE X-1314, SAE X-1315, SAE 1115, SAE 1120, X-1515, and SAE 1020.

SHOP KINKS

● A correspondent writes: "We instruct our men never to go ahead of a truck down a ramp. Serious accidents have occurred where this practice was not followed. If a man's foot should slip while he is in that position, the truck would very likely knock him down, run over him, or crush him against a wall."

● Scores of factory maintenance jobs can be handled, and often tough problems eliminated by keeping on hand Stressproof No. 2 bars for making innumerable replacement parts such as bolts, pins, shafts, etc. In one shop on a Punch Straightener (6" capacity), repeated impacts of the clutch action caused the bolts as originally made of SAE 1020 to break and shear frequently. This part was originally made of SAE 1020 but form fit bolts of Stressproof have now been in service 6 months without breakage.

Light-Weight Box Cars

Practically 70 per cent of welded footage in these units is spot welded, using high-tensile low-alloy steel as the material. Welding units employ automatic pressure, current and timing devices for exact control of results

Part II

■ PRODUCTION of welded light-weight box cars, see Fig 2, Part I, at Pullman-Standard Car Mfg. Co., Michigan City, Ind., is divided into two methods of construction. Building the underframe of modified open hearth steel Z-bar sills and high-tensile low-alloy attachments by arc welding was described in Part I, STEEL, p. 45, June 26, 1939. This second article takes up the construction and assembly of the body of the car, top, sides and ends, done almost entirely by spot welding sheets of high-tensile low-alloy steel into complete side, top and end units.

Of total welded footage required in constructing the box car, 2601 feet or 70 per cent is spot welding, almost all of which is in the body. In construction of all-welded passenger cars (STEEL, p. 51, Aug. 22; p. 43, Aug. 29, 1938) a substantial truss framework was welded up for each side of the car and the light flat side sheets stitch welded to this framework.

Sides Reinforced

In the construction of box cars, side reinforcements consist of Z-sections pressed in one vertical edge of each 0.05-inch low-alloy high-tensile steel side and sheet. This Z-flange is reinforced, Fig. 4A, by spot welding on a formed angle of the same material. A single row of spots is placed in each leg of the angle, which fits over the end angle in the Z-section making the reinforcement practically of double thickness. Press work in forming side sheets must be exact as any accumulated error in a few sheets, as assembled, would throw the entire side out of alignment and interfere with the final assembly. The wooden nailer strips are bolted on later.

The reinforced Z-section on the inside forms vertical posts on 23¼-inch centers. Two extra Z-bar posts are also welded on the inside of the sheets over the bolster for added reinforcement. Each side sheet is individually spot welded to its reinforcements, Fig. 2, before assembling in side.

Side Sheets Joined

Reinforced individual side sheets next are joined together progressively, Fig. 3, adding one sheet at a time until half a side in the section from the end to the door opening is welded together, thus building up the side sheets in sections equal to a quarter of a car.

In this jig, sheets are held in position and the welder "walks" along the side of the sheet, automatically spot welding the last side sheet added to the previously joined side sheets. Welding heads travel over the joint somewhat like the motion of an open-side planer except that work is stationary and welding head travels. Traveler is controlled by a roller chain on the floor track which serves as a rack, thus giving positive travel through a meshing gear or pinion. Two rows of spots, Fig. 4-A, spaced ¾-inch vertically and staggered with ⅞-inch between rows are placed in the overlapping plates, with the formed Z-section on the inside. Spacing, pressure, current and timing of welds are controlled automatically.

Two half-sides or quarters next

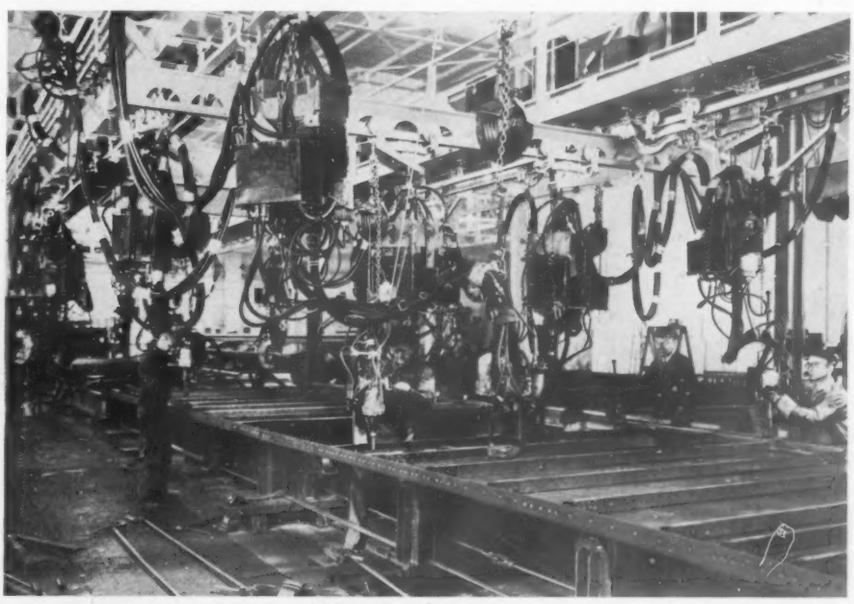


Fig. 1—Here two quarter sides are joined to top and bottom side plates forming a complete car side, using 18 hand positioned, automatically controlled spot welders

are positioned on a large open-side welding jig, Fig. 1, to form into a full car side, Fig. 5. The quarters of side sheets are joined together by spot welding on a side plate at top and a side sill, at bottom door posts and various reinforcements. The shape and location of these top and bottom plates is shown in the inside view of a car side, Fig. 5.

Bottom plate or side sill, Fig. 5, is a pressed angle, fitting into a formed depressed section near outside bottom edge of side sheets. When welded to side sill, it is practically even with the side, giving a longitudinal double-metal reinforcement.

Side Plate Stiffens Construction

Side plate (top) consists of a Z-bar with upper leg formed into a channel or goose neck. This acts as a stiffener as well as facilitating spot welding of roof by providing space in the open channel for applying the welding unit. Also, at each vertical Z-section side post on the side sheet, a short tie strip is welded on, Fig. 5, tying the Z-bar side post to the top side plate and having a projecting angle which later is welded to the carlines in roof. End side sheets and side sill are punched for riveting to ends and underframe in final assembly. Attachments, additional reinforcement at doors and door frame also are welded in at this point.

Portable welding equipment for joining quarters is shown in Fig. 1. This trolley is suspended from an overhead structure. It is pushed along and positioned by hand. Pressure, current and timing are preset and automatically controlled, however.

This installation employs 18 special spot welders, each set for a particular type of weld. These jaw type units are operated and positioned by hand as welds are accessible from edge or side. Parts are held in alignment by quick-setting clamps. Current, air pressure and control circuits are supplied through flexible leads, looped and suspended so they do not interfere with operation.

Car ends, Fig. 5, are of standard corrugated construction, press formed into two parts and arc butt-welded together. The heavier, lower end section is ⅛-inch steel plate and upper section is 3/32-inch.

TABLE I

Comparison of Pullman-Standard Light Weight Welded 50-Ton Capacity Box Car with A.A.R. Standard Car of Equivalent Capacity

	Pullman-Standard Car	A.A.R. Standard Car
	Weights in Pounds	
Car Body	21,000	29,100
Trucks	15,600	15,400
Complete Car	35,600	44,500
Underframe	5,797	7,879
Sides	3,532	5,933
Roof	1,190	2,086
Doors	527	724
Door Fixtures	415	556
Ends	1,209	2,350
Load Limit	133,400	124,500
Ratio of Lading to Rail Load	78.9%	73.7%
	Type of Steel Used	
Side Sheet	0.05-in. h.t., l.a.*	0.10-in. o.h.†
Roof Sheet	0.05-in. h.t., l.a.	14-gage o.h.
Door Sheet	0.05-in. h.t., l.a.	0.10-in. o.h.
End Sheet—Bottom	⅛-in. h.t., l.a.	¼-in. o.h.
End Sheet—Top	3/32-in. h.t., l.a.	3/16-in. o.h.
End Plate	⅛-in. h.t., l.a.	Integral with top sheet
Center Sills—A.A.R. Z-Section	31.3-lb. 11/32-in. thick, 18.4 sq. in., modified o.h. steel, 36,000 lb. min. yield point	36.2-lb. 13/32-in. thick, 21.3-sq. in., o.h. steel, 30,000 lb. yield point
Side Sills	6 x 3½ x ¼-in. h.t., l.a.	6 x 3½ x 5/16-in. o.h.
Side Sill Reinforcement	7/32-in. pressed channel h.t., l.a.	6-in. o.h. bulb angle
Side Plate	5/32-in. h.t., l.a. steel pressing	3-in. o.h. Z-section

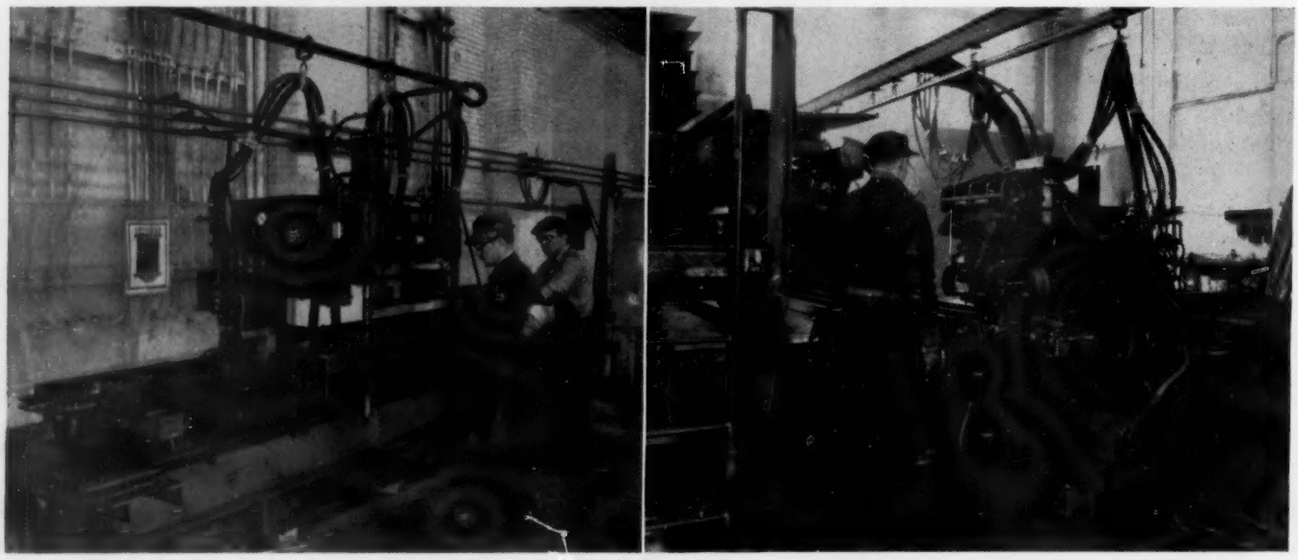
* High-tensile low-alloy steel.
† Open-hearth steel.

Using low-alloy high-tensile steel instead of plain open-hearth steel has permitted reduction of one-half in thickness over previous construction.

When forming corrugations in the end plates, edges are turned or cupped at right angle to form flanges which are punched for riveting to sides and roof. Vertical corners of cars are reinforced by inserting a formed strip in the riveted joint of side to end flange. These strips extend over at an angle to permit arc welding to end plates, thus forcing a triangular box reinforcement at vertical corners.

Ends are arc welded at bottom to end sill in underframe in an overlapping angular joint with an arc

Fig. 2. (Left)—First step in building a side is to spot weld angle reinforcement as shown in Fig. 4-A. Fig. 3. (Right)—Next individual side sheets are spot welded together, also as shown in Fig. 4-A



HOT MONEY

YESTERDAY *one thief* stole more dollars from American Industry than *all* the "stick-up" men took from the public.

This industrial thief is FRICTION. His "hot money" is *your* money—represented in wasted power, rapid wear, costly delays and repairs.

To catch money-stealing Friction red-handed is the job of a group of scientists, engineers and technicians as skilled in their own art as are the "G-Men."

And these "friction-catchers" are at your service instantly, anywhere in America.

Shell keeps a force of them always ready. They are armed with friction-killing lubricants of numerous types and grades. And these Shell specialists have an enviable record for their *arrests* of friction. Thousands of big and little cases on big and little machines crowd their case-history files.

Call in the Shell lubrication man today. There is no charge for his help and no obligation to you.

SHELL

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weld at both overlapping edges, thus providing a reinforced joint of double thickness.

Roofs are built up from formed sheets in a construction almost identical with that used in side construction. Carlines are Z-formed reinforcements on inside of car top, Fig. 4-B, similar to those formed on side sheets. Main difference is that top sheets are curved to contour of the car. A pressed angle reinforcement is spot welded to Z-bar, as on sides.

Roof is welded up in a continuous single unit in a special machine, Fig. 6, similar to that used for forming quarter sides except that it is built to follow the curved contour of the roof. These machines for sides and top operate on a roller chain track and are controlled automatically on a preset cycle. The double row of spots are 1-inch apart and staggered 1-inch apart in the rows.

Welding Spots Are Independent

Current in all double-spot welding units flows down from the points through the metal and out through the copper backup bar, each spot independent of the other. This differs from the construction of passenger cars where current flows from one point through the metal being welded to the copper backup bar, thence across and loops up through the metal and out the other point, thus making what might be termed a loop stitch.

Roof sheets are welded together for attaching to the formed Z-bar side plate on the top edge of sides. Then assembled roof is set on assembled sides and ends which have

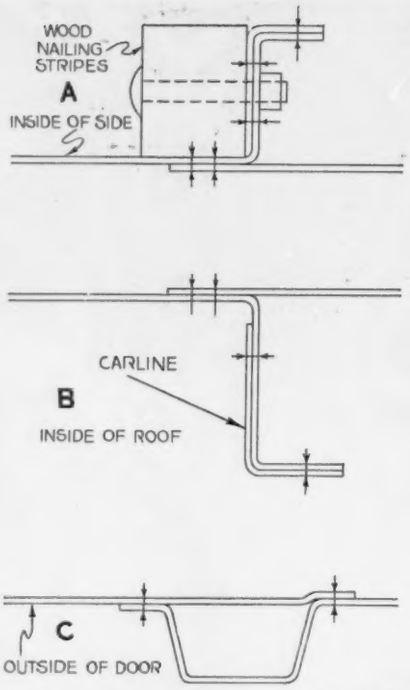


Fig. 4—Diagram of various types of joints employed

been mounted on the underframe. Before attaching sides and ends, underframe is mounted on its trucks for ease in movement through progressive assembly operations.

An automatic spot welder "walks" along the side and welds top to side plates. This practically completes the steel work on the car except for mounting doors, ladders, running board and other attachments by arc welding, riveting or bolting. With these added, car is moved to wood shop for installing of wooden floor and lining. For this, nailing strips, Fig. 4-A, are bolted to side posts. Car then is ready for the paint shop.

Doors also are made from formed sheets, spot welded together and to welded frame. Door sheets are formed by depressing a flanged channel in one edge. This channel rests on top of a flat side of adjacent sheet, Fig. 4-C, and is joined by two rows of spot welds one on each side of the channel, thus providing a box reinforcement on outside of doors and smooth surface on inside.

Door frame consists of a formed Z-bar spot welded to a structural angle, the lighter to the heavier metal. This, in turn, is spot welded to the built-up door and attachments are welded, riveted or bolted in place.

Former materials used consisted largely of open-hearth steel sheets and structural shapes joined by riveting. Substitution of high-tensile low-alloy steels has permitted a reduction in thickness to one-half that formerly required. Comparison of present and former dimensions and weights, as given in table I page 62, indicate the weight reductions effected.

All spot welding units are set for predetermined pressure, current and timing of the weld according to material, thickness and location of the spot. This is controlled through

(*Please turn to Page 73*)

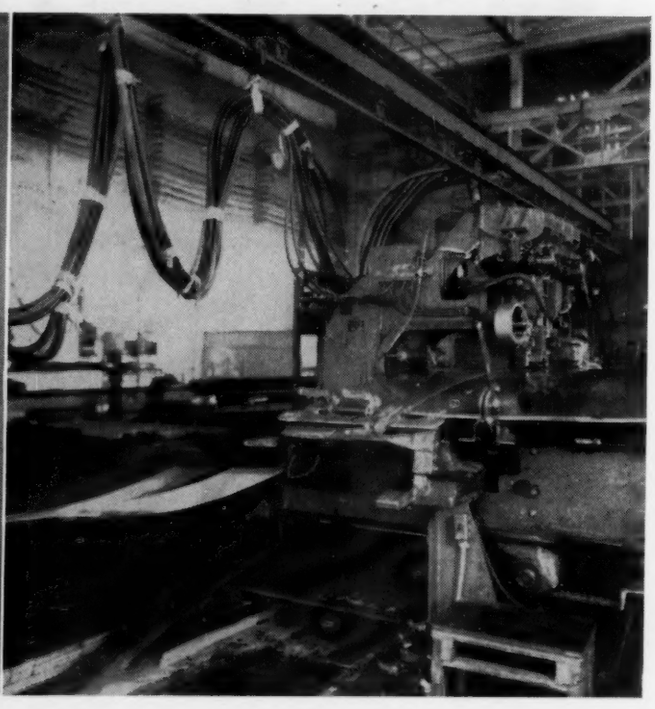
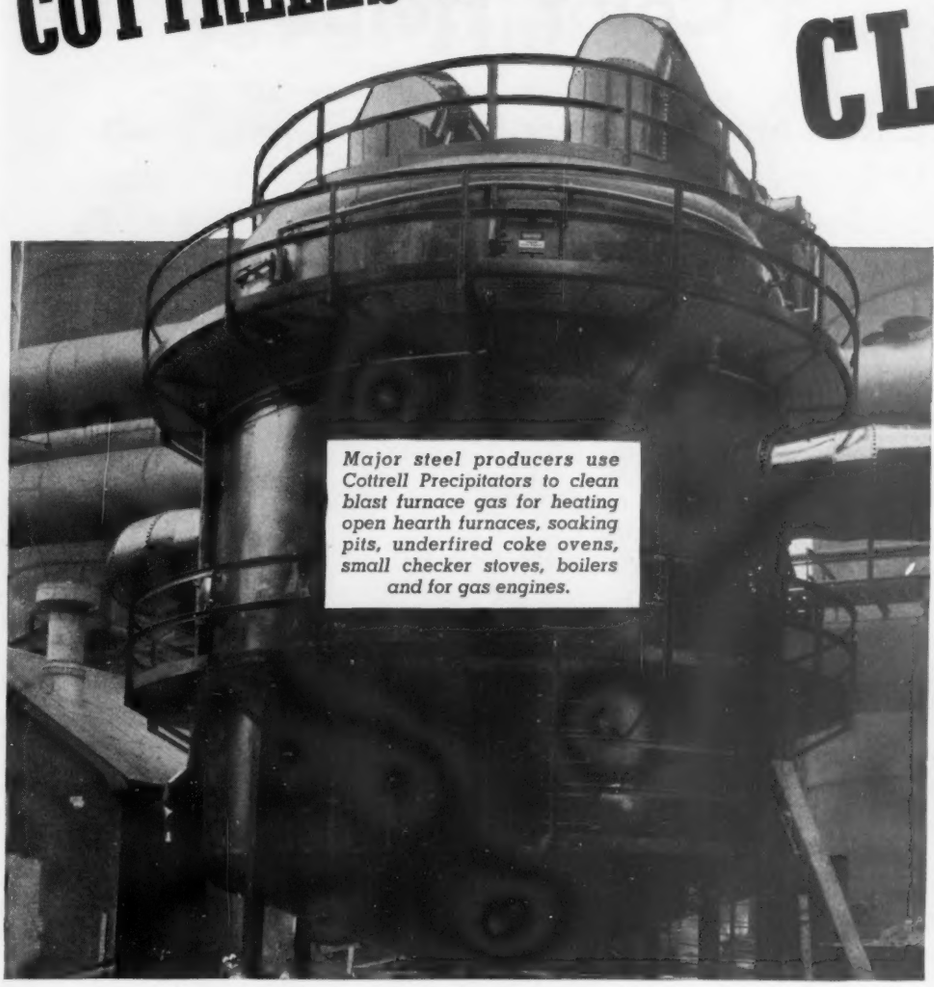


Fig. 5. (Left)—Inside view of box car. Fig. 6. (Right)—Roofs are fabricated by spot welding together individual roof sheets, diagrammed in Fig. 4-B

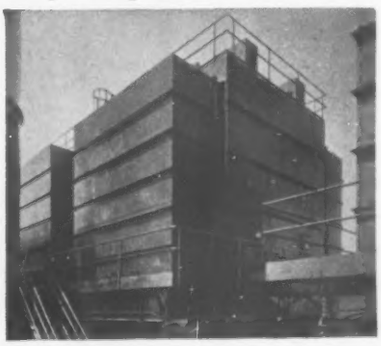
COTTRELLS CLEAN ANY GAS CLEAN



Major steel producers use Cottrell Precipitators to clean blast furnace gas for heating open hearth furnaces, soaking pits, underfired coke ovens, small checker stoves, boilers and for gas engines.

Cottrells are now de-tarring billions of cubic feet of all kinds of manufactured gas per day. They reduce oxide replacement and purifying expense. Excess back pressure disappears. They lengthen the life of pipe lines, valves, controls, regulators, meters, compressors and other gas process and transmission equipment.

Fly ash from more than a hundred pulverized coal-fired boilers is being removed by Cottrells in the United States alone. In Europe, Cottrells are universally installed in large power plants.



COTTRELLS COLLECT EVERYTHING SUSPENDED IN GAS

In the past 33 years, thousands of Cottrell Precipitators have been installed. They serve every industry that has a dust, fog, fume or mist problem. Cottrells are operating in every industrial country in the world. One installation cleans 2,500,000 cubic feet of gas per ***minute***. Another recovers a million dollars worth of gold a year at a smelter. Others clean hydrogen, collect sulphuric acid mist, recover arsenic, copper, antimony, mercury, and so on. Cottrells can be unconditionally guaranteed to clean **any** gas to **any** desired efficiency irrespective of particle size or character. Efficiencies of 99 per cent and higher are recorded and can be guaranteed—for any dust, fog, fume or mist condition. They may operate wet or dry. Operating costs run from 0.5 to 1.0 kw. per 100,000 cubic feet of gas cleaned. Installations last indefinitely.

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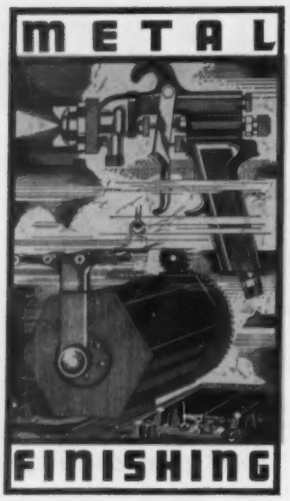


Color Helps

Choice of correct color for a room, workbench, tool, product, etc. assumes more importance day by day. What correct use of color has done and can do is sketched here to show what an effective aid this factor may be if understood properly

By JAMES McQUEENY
And
EDWARD PODOLSKY, M.D.

■ TODAY color is becoming known as a most important factor in selling goods, in providing the right atmosphere or background for various activities and as an aid in minimizing fatigue and increasing efficiency of workers in a wide variety of industries. Color has many purposes. For instance, the use of a light color on radiators may increase heat radiation as much as 25 per cent, thus saving fuel costs.

The oil industry has learned to use light colored paints on storage tanks to reduce absorbtion of thermal waves, thus cutting interior temperatures and accompanying evaporation.

The scientist Piccard, made his first flight into the stratosphere in a gondola painted black and he nearly roasted because the dark colored metal absorbed so much of the sun's heat. On his next flight the gondola was painted white and he nearly froze because white color kept out so much heat.

Color preferences are real and potent. One color preference study in which 115 men and 121 women stated their personal preference indicated that men preferred the colors in the following order: Blue, red, violet, green, blue (tint) and orange. Women preferred the colors in this order: Red, blue, violet (tint), violet, violet (shade) and blue (tint).

Inspection tables in certain hosiery mills were painted blue to relieve eyestrain. A manufacturer of radio tubes painted workmen's benches a light blue to offset the feeling of heat created by a welding process. A machine tool manufacturer dipped rough castings in a vivid red pigment and found that his machinists finished them more accurately; the red acted as a visual stimulus.

Lowers Accident Rate

A shoe manufacturer painted his black machinery a light color which afforded more contrast to the black and brown leathers and resulted in fewer imperfections in workmanship and a lower accident rate. Possibilities for productive improvement through the use of color still remain largely unexplored.

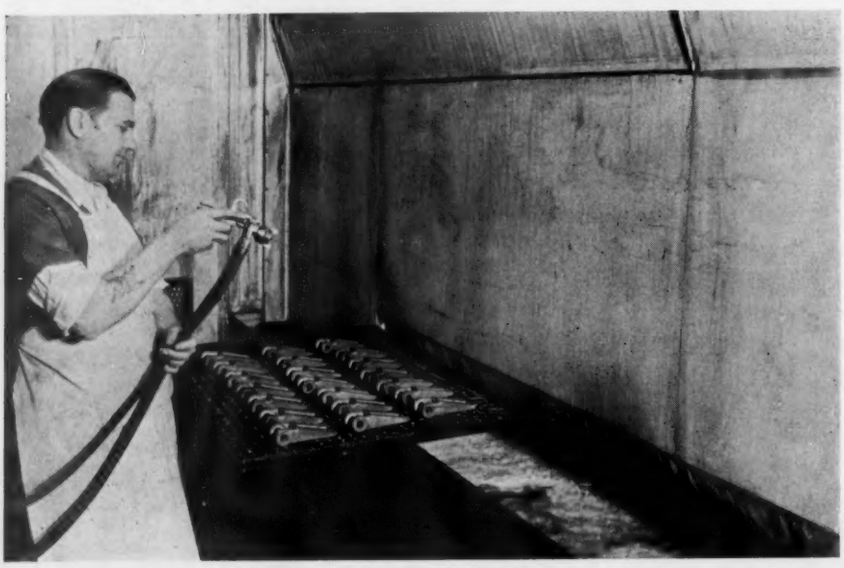
Highway safety, a serious modern problem, may be advanced greatly in the near future through the use of colored road materials. Tests have shown that a concrete road colored dull orange or marigold has at least 40 per cent less sun and headlight glare than an ordinary white road. This means less fatigue by day or by night and fewer accidents. The cost of adding color to paving material is said to be almost negligible.

Application of color to products

(*Please turn to Page* 74)

This is an abstract from an article in "The Rotarian," published by Rotary International, Chicago.

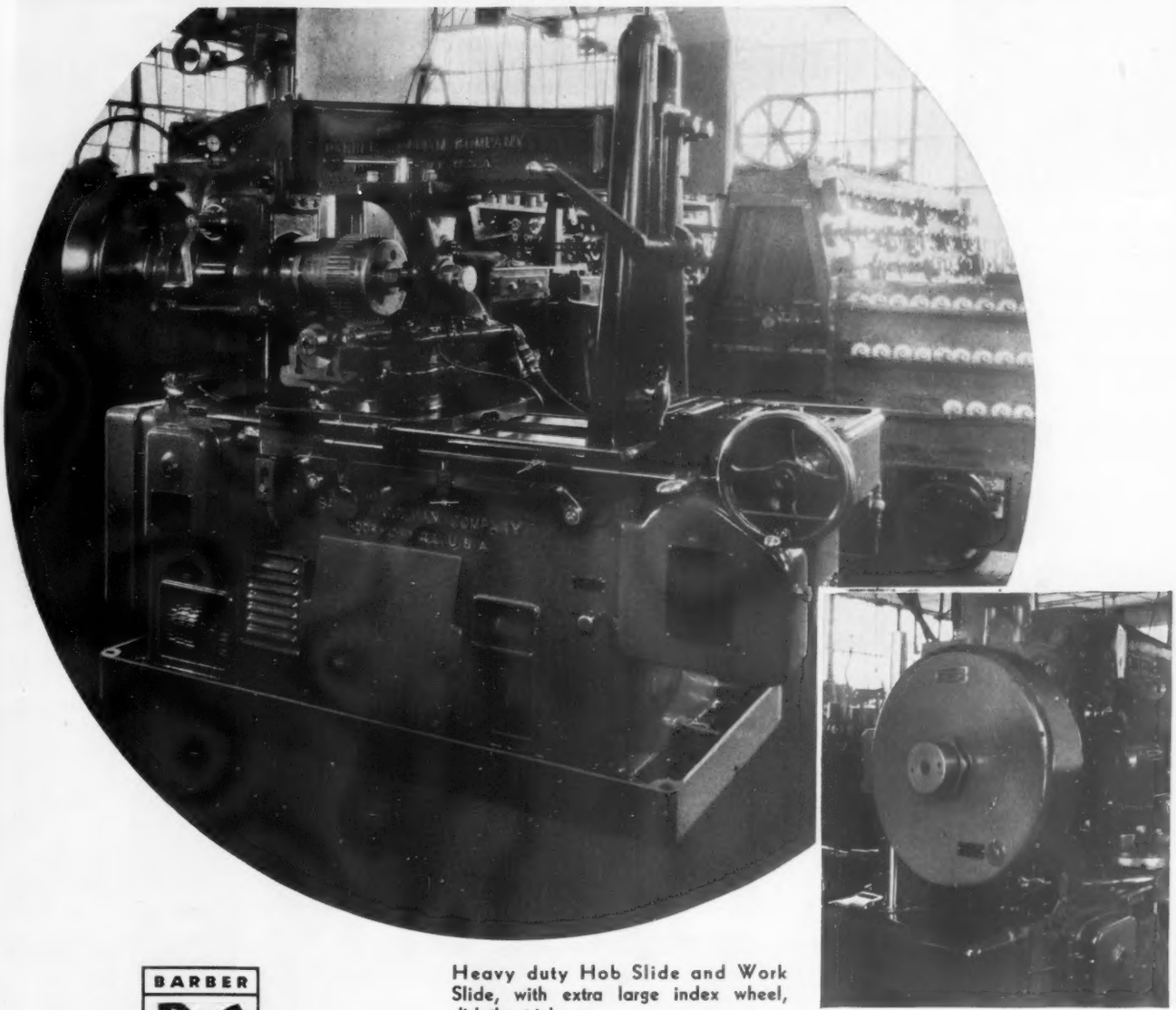
Water-Wash System in Spray Booth



■ **To protect health of operators and reduce fire hazard, rear wall of spray-booth is covered by a curtain of falling water chemically treated to absorb paint spray. Blowers draw air from booth through narrow opening at bottom of water curtain. Water for this booth falls at 22 gallons per minute and air velocity through opening is 130 feet per minute. Photo courtesy International Business Machines Corp., Endicott, N. Y.**

BARBER B-C COLMAN

Type A Hobbing Machine Saves Time on Tough Jobs



Heavy duty Hob Slide and Work Slide, with extra large index wheel, did the trick.

Material, production, and specially accurate indexing all combined to make a tough job out of hobbing mainshaft transmission gears . . . 5-6 pitch, 47 teeth, loaded two at a time, back to back for a total face of slightly more than 3". A Type A Hobbing Machine with extra heavy slides saves time on this exceptionally heavy work. A touch of Barber-Colman Engineering in the application of an extra large and accurate drive to the work-spindle mastered the remainder of this tough job. Write for the figures, and complete information on this machine.

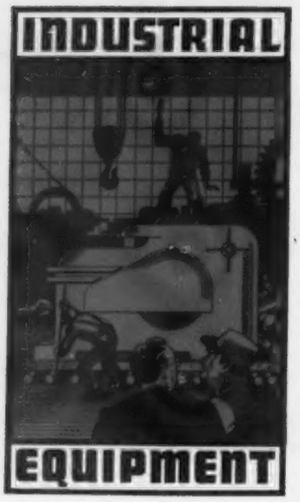
For bigger and tougher work, Type D. For smaller work, several sizes down to Type S. For all hobbing . . . Barber-Colman Hobs, and Engineering Service. Investigate.

BARBER B-C COLMAN PRODUCTS

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

BARBER-COLMAN COMPANY

General Offices and Plant ROCKFORD, ILLINOIS, U. S. A.



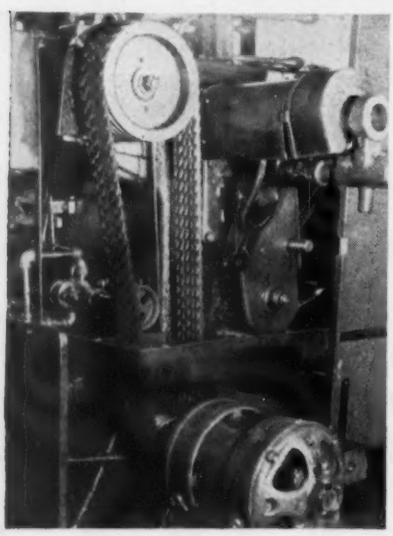
Portable Compressors

■ The Sullivan Machinery Co., Michigan City, Ind., announces two sizes of self-starting, "Zeph-Air" portable air-compressors with capacities of 60 and 85 cubic feet per min-

ute of delivered air. Although capable of operating breakers and rock drills, compressors are so compact the two-wheel mountings can be towed by pleasure car and skid-mounted type can be placed on body of a standard pick-up truck.

Neoprene V-Belt

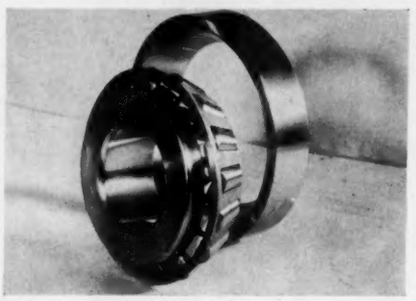
■ Manheim Mfg. & Belting Co., Manheim, Pa., announces an adjustable 60-second neoprene V-belting. Being quickly adjustable as to length, belting reduces direct in-



stallation cost and machine-down-time required for installing endless V-belts. Manufacturer claims belting can be uncoupled from roll and made endless on any drive in less than a minute.

Precision Bearing

■ Bantam Bearings Corp., South Bend, Ind., recently made ultra-precision bearings to be used on machines for boring, counterboring and reaming. High degree of accuracy in milling operation yielded face runout of 0.0001-inch, with cone operated in stationary outer race (ec-



centricity) of 0.0001-inch, bore of 0.0004-inch, roller tolerance of 0.0001-inch. Dimensions are 4 inches I.D. x 9⅞ inches O.D. x 2.87 inches wide.

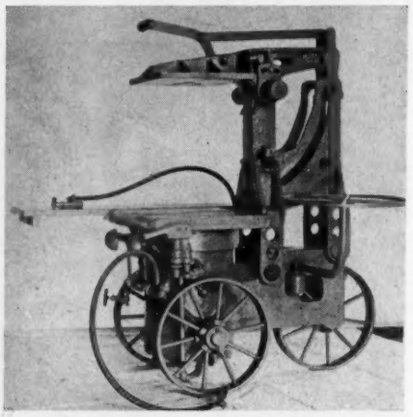
Electric Sander

■ Detroit Surfacing Machine Co., 7433 West Davison, Detroit, is putting on the market Easy electric sander, a portable all-electric reciprocating motion sanding, rubbing and polishing machine. Applications range from precision work to rough castings—new or refinishing operations on flat, curved or irregular

surfaces. Perfect balance, light weight (6¼ pounds), comfortable grip, convenient switch control and smooth reciprocating motion are claimed to insure easy, one-hand operation. Universal motor operating from alternating or direct-current light socket furnishes power. Fan mounted on motor shaft provides forced ventilation cooling.

Molding Machine

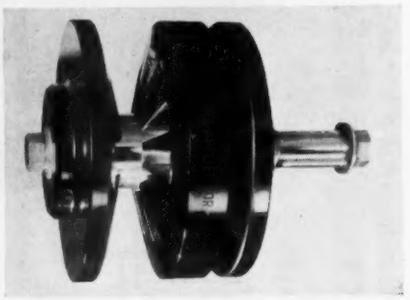
■ Herman Pneumatic Machine Co., 306 Fourth avenue, Pittsburgh, has introduced Jarr Squeeze molding machine with jolt feature and simplified control which make it possible



to manipulate machine with minimum amount of fatigue to operator. Squeeze head is balanced in both directions and is effortless in operation, with positive cam type locking device. Operating table is open in all directions when head is retracted. Guide cylinder and all wearing parts are generous and stress parts made from steel castings.

Variable Pulley

■ The Speedmaster Co. division of Continental Machines, Inc., 1301 Washington avenue south, Minneap-



olis, announces a 90 per cent efficient variable pulley delivering over 6 to 1 ratio and using standard V-belts. High-impact bakelite pulleys run on positively lubricated Oilite bearings, are noiseless and have long life. Unit operates at any angle. Ratio of 40 to 1 is available at output shaft.

Motor-Speed Regulator

■ Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has announced an anticipatory device to hold speed of direct-current motors constant within limits from no load to full load. Unit depends for its response on a flywheel or inertia member which is sensitive to rate of change of speed and to a member respon-

Advertisement

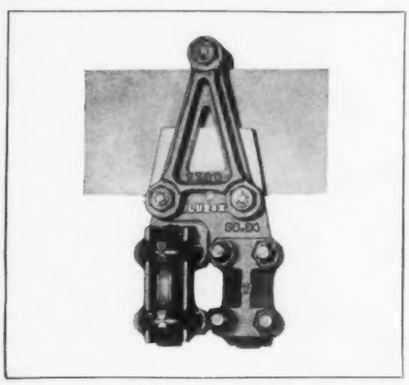
COPPER ALLOY BULLETIN

Reporting News and Technical Developments of Copper and Copper-Base Alloys

JULY "Bridgeport" BRASS CO. 1939

DELTA-STAR CONNECTORS USE DURONZE HARDWARE

Delta-Star Electric Company, Chicago, Ill., has issued a new and extremely comprehensive catalog of bus and cable connectors. Duronze* was selected on their equipment for bolts and nuts because of its dependability, high strength, and resistance to corrosion and season cracking. Another advantage is that its coefficient of thermal expansion is approximately the same as that of the copper and bronze with which it is used.



Typical of Delta-Star's line is the connector illustrated for tapping off two cables from a bus bar run without the use of solder.

PROGRESSIVE MACHINE OPERATIONS SPEED UP FABRICATING PROCESSES

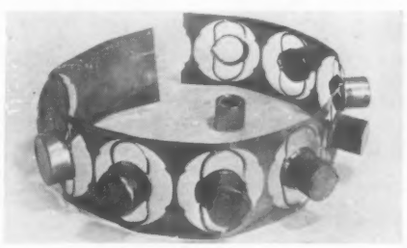
Substantial Production Economies Result from Elimination of Intermediate Anneal and Reduction of Scrap Losses

Progressive machine operations are gaining favor among brass goods manufacturers, particularly as a means for the fast, economical production of small parts. For this type of product, the progressive machine process in many cases possesses definite advantages over single operations.

Most important is the increase in the speed of flow through the manufacturing processes when progressive machine operations are used. Rapid sequence of steps on the machine cuts down the time factor and enables the fabricator to turn out parts much faster than is possible where a time delay occurs between successive steps.

Metal is Worked Gradually

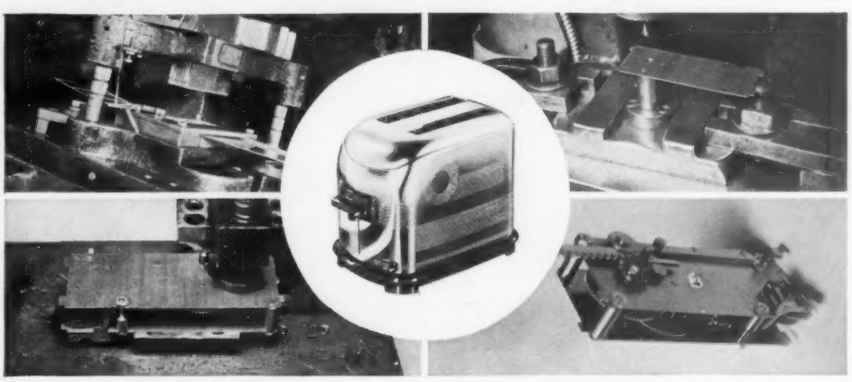
Contributing directly to higher production speed and saving the cost of an additional operation is the fact that the progressive machine operation eliminates the need of an intermediate anneal. This fact results from the difference in the way the metal is worked. Where parts are made by single operations, there is a natural tendency to work the metal as much as possible at each step, in order to decrease the number of steps necessary. This severe working hardens the metal, and it is necessary to interrupt the forming process in order to soften the metal by annealing. In progressive machine operations, on the other hand, the metal is formed by more gradual stages, and it is usually possible to eliminate the extra anneal.



Typical illustration of the advantages of progressive machine operations may be found in the manufacture of the small cup shown. Here the complete cup is formed from brass strip by a series of operations without any intermediate anneal. When first tried out, only small parts were made by progressive machine operations. Today, the tendency is to build larger and larger machines which naturally have greatly increased the range in sizes of the articles which can be fabricated.

(Continued on Following Page, Column 2)

MAKING THE TIMERS FOR TOASTMASTER TOASTERS



The flexible timer that regulates the length of time that bread remains in the ovens of McGraw Electric Company's Toastmaster Automatic Toaster is made largely from brass. Upper left, a strip of brass is being blanked out on a punch press to form the sides of the timer. Lower left, the small plate used to retain the spring is staked to the side of the timer. Upper right, a bushing is being installed in a sub-assembly operation. Lower right, is a view of the completed timer.

Memos on Brass — No. 1

Brass is adaptable to practically any type of fabrication. It can be cast, stamped, punched, drawn, forged, and machined. It can be furnished with the composition and temper that best fit it for any of these fabricating methods. Both simple and complicated shapes can readily be formed from this versatile metal.

PREPARED EACH MONTH BY THE BRIDGEPORT BRASS COMPANY

Headquarters for Brass, Bronze and Copper

COPPER ALLOY BULLETIN

TYPES OF COPPER

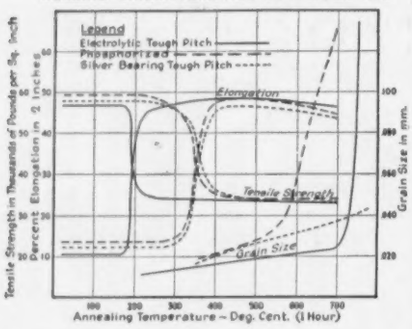
This is the fifth of a series on the various types of copper, their relative merits and uses.

Softening Temperature

Tough pitch electrolytic copper of highest purity has a softening temperature of about 200° C. By softening temperature is meant that temperature at which cold worked copper will lose most of the increased strength brought about by the cold working operation. This temperature will vary slightly depending on such factors as the amount of cold work, the previous annealing temperature and the time of exposure at the softening temperature. In copper, however, the addition of small quantities of other elements has a greater effect on the softening temperature than the method of processing.

The commercial importance of the exact temperature at which copper will soften is brought out in a number of applications. In some cases the relatively slight increase in softening temperatures brought about by very small quantities of impurities results in ununiform properties when anneals are made at low temperatures. In such cases the effect of these impurities is definitely objectionable. In many cases, however, the increased softening temperatures are desirable under controlled conditions and definite additions are made to the copper for this purpose.

EFFECT OF SILVER AND PHOSPHORUS ON ANNEALING CHARACTERISTICS OF COPPER ROD



The elements which tend to increase the softening point are those which have some solid solubility in the copper. Commercially the most important of these elements are silver and phosphorus. The amount of these elements required to raise the softening point appreciably varies considerably. In tough pitch copper, silver is commonly used in amounts of about .05%. In deoxidized copper, phosphorus in solid solution amounting to .02% will appreciably raise the softening point.

There are many applications of cold worked copper in which the increased softening point is desirable. These applications are those in which some heating, such as by soft soldering, is necessary. Common examples are water tubing, radiator fins, fire extinguishers and engraver's metal.

The accompanying curves illustrate the effect of these added elements on the softening temperatures and other physical properties of annealed material.

Fabricators desiring information on the various types of copper or copper alloys in specific uses are invited to discuss their problems with Bridgeport Brass Company.

PROGRESSIVE OPERATIONS

(Continued from Preceding Page, Column 3)

Satisfactory results from the process depend upon correct selection and careful control of the properties of the original brass strip. In particular, care must be taken to see that the metal is correctly annealed to withstand the forming operations, or the benefits of the process will be nullified. If the original metal is too hard, or if the alloy is not sufficiently ductile, it will tend to crack under the forming operations. For this reason it is desirable, in selecting metal for progressive machine operations, to acquaint the brass supplier with the details of the forming operations. Bridgeport Brass Company is exceptionally well equipped to supply the brass goods manufacturer with metal of the necessary characteristics, and the company's metallurgists will gladly study the requirements of specific forming jobs, to insure supplying the correct alloy and temper.

Committee to Study Corrosion

The recently organized Coordinating Committee on Corrosion has undertaken the distribution of a questionnaire to collect information on corrosion projects now in progress. The questionnaire also aims to learn if the findings of projects are available to other interested persons.

NEW DEVELOPMENTS

This column lists items manufactured or developed by many different sources. Further information on any of these items may be obtained by writing the Bridgeport Brass Company, which will gladly refer readers to the manufacturer or other source.

A new cleaner is intended for application to nickel plate before chromium plating. It is reported to help in the production of a clean, lustrous chromium plate, and to eliminate much buffing work. According to the manufacturer, proper use of the cleaner often results in production economies.

A marking unit is designed for rolling knurled bands on small metal rods and pins. It is said to be suitable for use where accurate dimensions must be maintained in the knurling process. Machine is available either with revolving hopper for automatic feed or with inclined chute for hand feeding.

Safety tongs are designed for handling small parts in and out of a punch press. It is reported to be of assistance in keeping operator's hands at a safe distance from the dies. One side of tongs is curved to fit in operator's palm; the other has a closed circle for thumb grip.

A dressing tool for spot welding electrodes is air-operated. It is said to be useful in reshaping electrode points after they have become worn, without removing them from the machine. Cutters are designed to run freely after electrode is dressed to proper shape.

A metallographic liquid assists in the preparation of scratch-free metal specimens for microscopic examination, according to the manufacturer. It is said to remove metal or abrasive particles formed during polishing. It is brushed on the specimens, which are then rinsed in running water. It is claimed that the liquid has no etching effect on copper or its alloys.

A metallizing gun is designed for operation on propane gas. It is said to produce extremely fine coatings at production speeds. Two speed ranges are available. Spraying speeds are said to be equal to those obtained with hydrogen, and slightly lower than with acetylene.

A micrometer gage can be used to check inside diameters of small holes and outside diameters or thicknesses of small parts. It is reported to read directly the plus or minus variation in divisions of .0001 inch from a preset zero.

Carbide inserts for dies used in stamping and drawing are said to outlast ordinary tool steel dies many times. According to the manufacturer, production tests recently showed a total of 70,000 pieces, compared with 14,000 for tool steel dies in the same service.

A new arc welder is equipped with a self-indicating current control, which is said to result in greater convenience and accuracy in welding. According to the manufacturer, the operator can adjust both the slope of the volt-ampere curve and the amount of welding current to suit the job requirements.

PRODUCTS OF THE BRIDGEPORT BRASS COMPANY

Executive Offices: BRIDGEPORT, CONN.—Branch Offices and Warehouses in Principal Cities

SHEETS, ROLLS, STRIPS—*Brass, bronze, copper, Duronze,** for stamping, deep drawing, forming and spinning.

CONDENSER, HEAT EXCHANGER, SUGAR TUBES—For steam surface condensers, heat exchangers; oil refineries, and process industries.

PHONO-ELECTRIC* ALLOYS—High-strength bronze trolley, messenger wire and cable.

WELDING ROD—For repairing cast iron and steel, fabricating silicon bronze tanks.

LEDRITE* ROD—For making automatic screw machine products.

"Bridgeport" BRASS CO. *Established 1865*

COPPER WATER TUBE AND FITTINGS—For plumbing, heating, underground piping.

DURONZE ALLOYS—High-strength silicon bronzes for corrosion-resistant connectors, marine hardware; *hot rolled sheets* for tanks, boilers, heaters, flues, ducts, flashings.

BRASS, BRONZE, DURONZE WIRE—For cap and machine screws, wood screws, rivets, bolts, nuts.

FABRICATING SERVICE DEPT.—Engineering staff, special equipment for making parts or complete items.

BRASS AND COPPER PIPE—"Plumrite"* for plumbing, underground and industrial services.

*Trade-name.

BRIDGEPORT BRASS

sive to change in speed both acting on a single pair of contacts. Time delays are offset and regulator is anti-hunting in action.

♦

Ford Demonstrates New Farm Tractor

(*Concluded from Page* 20)

range of 1200 to 2200 revolutions per minute.

Clutch is a single dry plate with 9-inch effective diameter. Transmission is of the sliding gear type with three speeds forward and one reverse, all shafts running on tapered roller bearings. Drive to the rear wheels is a spiral bevel gear type with straddle mounted pinion, ratio being 6.66 to 1. A four-pinion differential is mounted on roller bearings. Drive axle is of the semi-floating type with axle shaft and wheel hub integral.

Speeds are 2½ miles per hour in low gear at normal engine speed, 3¼ at intermediate or plowing gear, 6 in high and 2¾ in reverse.

Front wheels are steel disks fitted with 19 x 4 single-rib pneumatic tires on drop-center rims. Front tread is adjustable by means of a telescoping axle beam and reversible wheel disks, from 48 inches to 76 inches in 4-inch steps. Rear wheels are also steel disks fitted with 32 x 8 traction-tread pneumatic tires on drop-center rims, carrying 12-pound pressure. Rear tread is adjustable by means of reversible wheel disks as well as reversible tire rims, from 48 to 76 inches in 4-inch steps.

Overall length of the tractor from front tire fin to end of lower link is 115 inches. Overall width is 64 inches and overall height is 52 inches. Ground clearance is 13 inches at the center and 21 inches under axles. Minimum turning circle is 15-foot diameter with the use of foot brake on one rear wheel.

Cast Steel Used

Significant in the design of the tractor is the extensive use of cast steel, magnesium and aluminum. High-strength cast steel developed by Ford engineers is used in all main supporting members and provides ample strength with minimum weight. Magnesium is used, for example, in the quadrant on which the implement shifting lever rides. Aluminum is used in the radiator grille.

The Ferguson tractor is claimed to be a proved piece of equipment, several thousand of them having been manufactured and sold in the British Isles where the government is offering farmers 5-year loans at 3 per cent to finance purchase of the tractors, only down payment required being the cash received from the sale of two horses which the H-F tractor is calculated to supplant. Actually, Mr. Ferguson and his associates have been working on the design for 22 years, and it is only in the last three years that most of their aims have been achieved.

Operation of the tractor is simplicity itself, one demonstration being the driving of the unit by an 8-year old lad who experienced no difficulty whatever in manipulating turns and in raising and lowering implements into and out of the ground, this being controlled hydraulically through manipulation of an 8-inch lever. The control comprises a 4-cylinder pump supplying oil under suitable pressure to a ram cylinder, the pressure controlled by an automatically actuated valve. All this mechanism is enclosed in a cast steel housing which is bolted on at the rear of the transmission case.

Another feature is the dispensing with the need for lubrication of all exposed joints in the tractor mechanism. Rust-resistant steel of high hardness is used in these parts and lubrication is not recommended since it would only collect dirt and grit which might grind away some of the steel. With the steel impervious to the elements, dry joints are employed, guaranteed to give good service for 20 years.

Proven Savings Not Mere Claims!

You take no chances when you use NON-FLUID oil. Its ability to save money is being proven day after day in many large steel plants.

NON-FLUID oil outlasts oil 3 to 5 times—gives clean, more constant and more dependable lubrication—reduces maintenance and repair cost.

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Malleable Founders Meet

■ FRANK O. PARKER, sales manager, Acme Steel & Malleable Iron Works, Buffalo, was re-elected president of the Malleable Founders society at the annual meeting, Westchester Country club, Rye, N. Y., June 23-24.

John A. Wagner, president, Wagner Malleable Iron Co., Decatur, Ill., was re-elected vice president and Robert E. Belt again was named secretary-treasurer.

The new board of directors, named at recent sectional meetings and organized at the annual meeting, is as follows:

C. L. Carter, president and general manager, Albion Malleable Iron Co., Albion, Mich.; Charles A. Gutenkunst Jr., president, Milwaukee Malleable & Gray Iron Co., Milwaukee.

W. V. Tiscornia, vice president, Auto Specialties Mfg. Co., St. Joseph, Mich.; John A. Wagner, president, Wagner Malleable Iron Co., Decatur, Ill.; Anthony Haswell, vice president, Dayton Malleable Iron Co., Dayton, O.; Arthur F. Jackson, vice president and general manager, Michigan Malleable Iron Co., Detroit.

H. A. Marti, secretary-treasurer and general manager, Maumee Malleable Iron Co., Toledo, O.; C. H. McCrea, manager Cleveland Works, National Malleable & Steel Castings Co., Cleveland; H. Nelson Albright, manager, Columbia Malleable Castings Corp., Columbia, Pa.

L. A. Dibble, president, Eastern Malleable Iron Co., Naugatuck, Conn.; Frank O. Parker, sales manager, Acme Steel & Malleable Iron Works, Buffalo; and F. C. Tuttle Jr., manager, Belcher Malleable Iron Co., Easton, Mass.

Market Development Discussed

Market development featured two sessions. On Friday morning, Stanley A. Knisely, director of advertising, Republic Steel Corp., Cleveland, presented an interesting discussion of "Co-Operative Industrial Sales Promotion." Mr. Knisely indicated that the basis of such a program must consist of co-operative scientific research to improve the product and methods of production; co-operative marketing research; and co-operative study of new uses.

At the second session, E. E. Griest, Fort Pitt Malleable Iron Co., McKees Rocks, Pa., and chairman of the committee on publicity and market development, reported on the work that has been undertaken by his group. Mr. Griest discussed several instances where proper market development work should result in the further use of large tonnages of malleable iron castings.

James L. Cawthon Jr., development engineer of the society, discussed the market development and publicity program of the society. He distributed the first of a series of folders produced by the society entitled "Malleable Iron Facts," and nine engineering data file sheets, each illustrating and describing specific applications of malleable iron castings.

James H. Lansing, shop practice engineer of the society presented interesting results of a survey on molding sand.

Saturday morning, Prof. Enrique Touceda, consulting engineer for the society, discussed several studies now being made, including the action of 0.25 per cent lead on the structure and machinability of malleable iron; the effect of 1.15 and 0.18 per cent phosphorus on malleable iron when subjected to subzero temperatures;; and the specific values of the various tensile properties of malleable iron. Preliminary studies indicate 0.25 per cent lead tends to produce a pearlitic structure. The tensile tests deal with the measurement of elongation of various materials at maximum load and at failure, with further study to be made.

Protect Your Workers with

MORTON'S SALT TABLETS

Heat-Fag is real — an unseen but powerful force that rides every hot wave . . . a force that costs industry thousands of dollars each year. For, hot days and heavy work make men sweat — and, unless the salt that's sweated out of their bodies is replaced, Heat-Fag takes its toll, production sags and profits suffer. This fact is known by medical men everywhere and by safety directors, executives and plant superintendents.

Prevent HEAT-FAG in Your Plant

Place Morton's Salt Tablet Dispensers at drinking fountains. These modern, sanitary dispensers represent the most efficient and economical way to provide workers with salt. A single push of the lever dispenses one tablet at a time.

MORTON'S SALT TABLETS Dissolve in 50 Seconds

They are easy to take — dissolve quickly. Only the purest and most highly refined salt is used.

Anticipate the Hot Days Ahead

Install Morton's Dispensers and Salt Tablets in your plant now. Place your order today. Remember — a small investment now will pay big dividends in Heat-Fag protection. Shipment will be made promptly — prepaid.

Write for folder — "Heat-Fag"

MORTON SALT COMPANY CHICAGO, ILLINOIS

Light-Weight Box Cars

(*Concluded from Page* 64)

locked cabinets to which only the inspector has the key. Every day this inspector makes a test weld on each unit on identical thickness and material welded by that unit to see that the welding unit is functioning properly.

Each unit is designed, constructed and used for only one class of work. Spot welding equipment consists of two, nonindexing, double head, 75 kilovolt-ampere units for side and roof sheet assembly; two, indexing, automatic, single head, 100 kilovolt-ampere machines for door sheet and door post assembly; four, stationary, 50 kilovolt-ampere units for welding on reinforcements and miscellaneous subassemblies; nine, portable, 100 kilovolt-ampere and 18, portable, 75 kilovolt-ampere units for building up the sides, attaching Z-bars to roof and welding roof to sides, and other special subassembly and final assembly operations.

Electric power is supplied at 480 volts, 60 cycles, primary voltage which is applied to electrodes of welding units at 14 volts, 5000 to 6000 amperes. Welding time varies from 6 to 45 cycles, automatically controlled, with an average timing of approximately 10 cycles. Mechanical pressure on sheets welded, air applied, varies from 700 to 4000 pounds, depending upon the thickness of material, with an average of 1200 pounds. Welding rates up to 250 spots per minute are attained when building up roof sheets and side sheets on double-head machines.

Possible economies to the railroads in reduced deadweight indicate a big future for light-weight cars when railroads are able to finance new equipment. This manufacturing installation is one of many developed during the depression to offer newly designed products with important economic advantages. Designs described are covered by Pullman-Standard patents and patents pending.

Show To Emphasize Machine Tool Progress

(*Concluded from Page* 17)

same ends achieved on machines which themselves were essentially the same as the most advanced models at the 1935 show, but whose tooling equipment has in the meantime been greatly improved. As a matter of fact, tooling developments alone since 1935 would well justify this 1939 show, regardless of any improvements in machine tools themselves.

What I already have been privileged to see of what the great machine tool using fraternity is going to see in Cleveland in October, has convinced me of one thing in particular, and it is extremely important. It is that the improved machine tools and improved tooling equipment such as will be exhibited at Cleveland this fall are destined within the next four or five years to make untold thousands of desirable jobs in this country.

This improved equipment, through its ability to do finer work at lower cost with less operating effort, will bring many new products within the realm of economical mass production. At the same time it will improve, cut the cost and thus bring into much more common use the various mass production products, mechanical refrigerators, for instance, with which everyone is now familiar but which are still out of reach of a big section of our population because of relatively high cost.

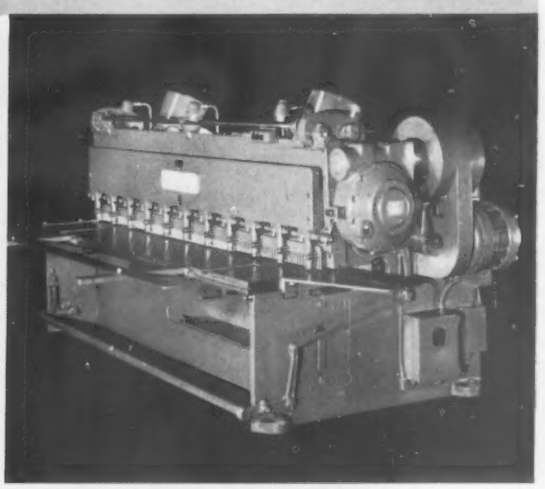
To turn out more goods for more people is going to require more as well as better machine tools. Despite misconceptions of some people who lately have gained considerable popular attention, machine tools must have operators and the more machines there are the more operators there must be.

RIGHT–LOOKING WELDING MAKES A BETTER LOOKING PRODUCT

And, eye appeal makes any product just a little easier to sell.

Many makers of welded equipment realize this fact and rely on Murex Electrodes for the sort of welding that is not only sound, and lives up to every physical requirement, but also is clean-cut and looks the part.

Write and ask to have a representative show how Murex assures smooth deposits and perfect contours, with minimum spatter and undercutting even at extremely high currents.



There's a handy, pocket-size pamphlet giving data on all electrodes in the Murex line. Send for your copy.

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ELECTRODES

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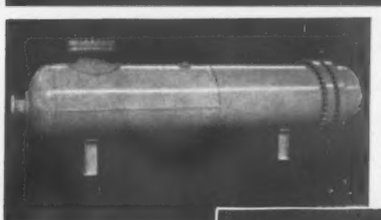
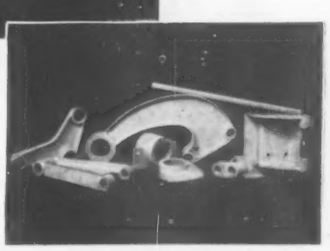


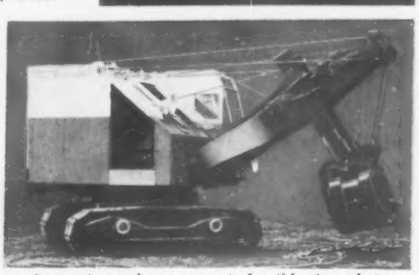
1 This welded shear is strong, rigid, precise—and looks it. Flawless, well-shaped welds play their part. *Photo: Cincinnati Shaper Co., Cincinnati, Ohio.*

2 Murex welded seams in this heat exchanger suggest careful fabrication. *Photo: Struthers-Wells, Warren, Pa.*



3 Smooth, clean Murex deposits make welded parts neat and trim. *Photo: The Dorr Company, Denver, Colo.*

4 Good proportions of this mill drive suggest strength. Well-formed Murex welds help. *Photo: Farrell-Birmingham Company, Ansonia, Conn.*



5 Ruggedness is apparent in this tunnel type shovel. Welds, too, look sound and strong. *Photo: Marion Steam Shovel Company, Marion, Ohio.*

Flexible Conveyor System

(*Concluded from Page* 49)

or any of the equipment under it.

The test operator also has a foot switch so placed that he can operate controls from only one position—namely, from behind the desk, facing the test booths with all controls within reach.

With present setup on surge generator from 20 to 40 units can be tested hourly, depending on type of transformer.

♦

Zirconium-Copper in Melt Improves Bronzes

■ Zirconium-copper, a new material for improving standard brasses and bronzes, is now supplied in the form of a concentrate by P. R. Mallory & Co. Inc., Indianapolis. The zirconium not only acts as a deoxidizer and scavenger of a melt but, when alloyed with manganese bronzes, aluminum bronzes and others, it gives increased hardness and tensile strength, higher thermal and electrical conductivity, and improved corrosion resistance. Fine grain materials with clean grain boundaries result from its use.

The zirconium-copper concentrate, the company states, has been found to be of particular advantage in producing nickel bronzes. The ductility of such alloys is substantially increased, giving greater reliability to sand cast material.

Mallory metallurgists have developed new methods of heat-treating zirconium bearing alloys to further improve their properties and make them particularly resistant to creep and oxidation at elevated temperatures. Proper melting and pouring methods have also been worked out.

Two standard concentrations, containing 12½ per cent and 35 per cent zirconium, respectively, are supplied. They are produced by the "Hydrimet" process which insures highest purity. The most widely used concentration is the 35 per cent zirconium-copper which is furnished in the form of bars and lumps having a high density. The concentration will alloy immediately and without difficulty with a melt, resulting in the highest recovery of zirconium.

Paper Intensifies Lines

■ To supplement ink in drafting rooms, Frederick Post Co., Chicago, has developed Pencil-tex. Of similar appearance to fine tracing cloth, it has a velvety surface with an affinity for pencils of all degrees of hardness.

Automotive Die Castings

(*Concluded from Page* 39)

castings on the particular gate, or the castings are broken from the gate by hand at an appropriate station, placed in a tote box and then delivered to an adjacent machine set up for fin removal.

In certain instances the fin occurs at a point where machining is required so fin removal is done by the machining tool. Practically all other castings have external fins removed by shearing dies, sometimes punching or broaching fins from holes in the same operation. In other cases, separate punching or broaching of fins in holes is necessary. In all cases, fin removal is accomplished immediately adjacent to or close by the casting machine.

All castings are produced in dies with four or more cavities. In some cases, all castings on a gate are trimmed of fins simultaneously in a single stroke of the press.

Among the unusual features is the use of chain conveyors carrying frames with three tiers of buckets and others with three rows of recesses at different levels. These are designed to sort the parts in accordance with the operations done on them and also to provide a limited reserve or bank of parts when all operations are not in exact step. Trimmed castings may be placed in the top row of buckets or on the top row of recesses in frames as they come from the trimming press. The part taken from the top row may be machined and returned to the next lower row and subsequently taken from that row for another operation and replaced on a still lower row, from which it is finally removed at the required point on the line. At various stations the chain is raised or lowered to bring the buckets and frames at a height where the operators can reach them easily.

Three endless chain conveyors carry the castings from cleaning and machining areas on to grinding, polishing and buffing operations. The units requiring plating are handled in the automatic plating equipment; those not plated going directly to assembly and shipping floor. Finishing operations will be described in a subsequent article.

♦

Color Helps

(*Concluded from Page* 66)

has received much study. However, the field is just beginning to develop its possibilities. Shelves in stores today contain merchandise colored or packaged more gaily than ever before. Two decades ago 88 per cent of all blankets sold were white, 95 per cent of all fountain pens were black, and every car owner knew he could buy a Ford in any color he wanted to provided it was black. Twenty years have changed all that.

Toothbrushes, for instance, are available today not only in various kinds of bristles but also in many colors. One expert who has devoted himself to the question found that if the handle of a 10-cent toothbrush was red, it boosted sales; but in a 25-cent toothbrush a red handle was comparatively a handicap. An amber handle, for instance, was considerably better. Thus business today is exploring the possibilities of color in many new ways.

Holiday Shutdowns To Cut Production

Prompt Recovery Seen; Seasonal Effect On Demand Moderate

MARKET IN TABLOID ★

Demand

Holding; June business compares favorably with May.

Prices

Firming gradually; Scrap generally steady.

Production

Down ½-point last week to 54 per cent.

■ STEEL markets made a relatively good showing in June, business being steady or slightly higher compared with May. This week will see a sharp letdown in both production and consumption, but prompt recovery from influence of the holiday and plant vacations is indicated.

Ingot production last week was down ½-point to 54 per cent. A year ago the rate was 28 per cent.

A number of metalworking plants are closed until July 10 for Independence day observance, vacations or inventory-taking. This is having a temporary retarding effect on steel shipments. However, prospects are favorable for the maintenance of steelmaking near its recent level during most of July and August.

The tendency toward firmer steel prices, as reported a week ago, continues. Instances of concessions have not disappeared entirely, but additional producers have withdrawn quotations below official levels, and there are expectations the new quarter will see prices on the most stable basis so far this year. It is recognized, of course, that heavy orders already booked at low prices account for much of the lifting of pressure against quotations, but there is a growing disposition to attempt to restore business to a more profitable basis.

Outlook For Some Large Steel Users Uncertain

Uncertainty over probable steel requirements of some leading consumers the next six months prevents any accurate forecast of the long-range trend in steelmaking. Automobile sales the past 60 days were better than was expected earlier in the year and enhance prospects for new model demand during coming months. Building, engineering construction and ship work apparently will furnish sustained demand for heavy steel products at least through third quarter. Railroad steel purchases the remainder of the year are difficult to estimate but could be a factor in stimulating operations markedly.

With several automobile plants down for model changes and others preparing to follow suit, assemblies last week started the expected decline. Total production of 70,663 units was a drop of more than 10,000 but remained well above the 40,945 units built a year ago. Ford output was practically unchanged at 19,600, and Chrysler slipped only from 22,650 to 21,810, but General Motors cut from 30,160 to 22,873 and all others curtailed from 8560 to 6380.

Meanwhile, steel releases from auto partsmakers are growing, but total consumption by the industry will decline this month. Part of the slack will be made up by heavier shipments of flat-rolled steel to other consumers against recent orders. Movement of this tonnage recently has shown fair gains, and demand from miscellaneous buyers generally has been encouraging.

Railroads Better Buyers But New Inquiries Light

A moderate flurry in material and equipment orders from railroads is unaccompanied by new inquiries to support a continuation of such activity. Western Maryland has ordered 1110 freight cars, and the Florida East Coast has placed two seven-car stainless steel passenger trains. Locomotive purchases include three steam units for the Green Bay & Western, one diesel-electric passenger locomotive for the Rock Island and one diesel switcher for the Wabash.

Burlington has bought 7700 tons of rails and the Kansas, Oklahoma & Gulf 3200 tons. Little additional rail buying is in sight before late summer or fall.

Tin plate production is down slightly. The dip is regarded only temporary as demand is sustained.

Steelmaking was unchanged at most centers the past week. Gains of 1½ points to 51 per cent at Chicago and 5 points to 65 at Cincinnati were slightly more than offset by losses of 4½ points to 51 per cent at Cleveland, 3 points to 51 at Youngstown and 4½ points to 35 at Buffalo.

Unchanged districts included Pittsburgh at 47, eastern Pennsylvania at 38, Wheeling at 79, Birmingham at 71, New England at 32, Detroit at 57 and St. Louis at 42.

Scrap trading is quiet. Most prices are steady, but a small decline at Chicago lowers the composite 8 cents to $14.54. The finished steel composite is unchanged at $55.70.

COMPOSITE MARKET AVERAGES

	July 1	June 24	June 17	One Month Ago June, 1939	Three Months Ago April, 1939	One Year Ago July, 1938	Five Years Ago July, 1934
Iron and Steel	$35.72	$35.72	$35.71	$35.69	$36.34	$36.32	$32.32
Finished Steel	55.70	55.70	55.70	55.70	56.50	57.20	54.05
Steelworks Scrap..	14.54	14.62	14.62	14.49	14.98	13.06	10.30

Iron and Steel Composite:—Pig iron, scrap, billets, sheet bars, wire rods, tin plate, wire, sheets, plates, shapes, bars, black pipe, rails, alloy steel, hot strip, and cast iron pipe at representative centers. Finished Steel Composite:—Plates, shapes, bars, hot strip, nails, tin plate, pipe. Steelworks Scrap Composite:—Heavy melting steel and compressed sheets.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished Material

	July 1, 1939	June, 1939	April, 1939	July, 1938
Steel bars, Pittsburgh	2.15c	2.15c	2.25c	2.25c
Steel bars, Chicago	2.15	2.15	2.25	2.25
Steel bars, Philadelphia	2.47	2.47	2.57	2.57
Iron bars, Terre Haute, Ind.....	2.05	2.05	2.15	2.15
Shapes, Pittsburgh	2.10	2.10	2.10	2.10
Shapes, Philadelphia	2.215	2.215	2.215	2.215
Shapes, Chicago	2.10	2.10	2.10	2.10
Plates, Pittsburgh	2.10	2.10	2.10	2.10
Plates, Philadelphia	2.15	2.15	2.15	2.15
Plates, Chicago	2.10	2.10	2.10	2.10
Sheets, hot-rolled, Pittsburgh....	2.00	2.00	2.15	2.15
Sheets, cold-rolled, Pittsburgh...	3.05	3.05	3.20	3.20
Sheets, No. 24 galv., Pittsburgh..	3.50	3.50	3.50	3.50
Sheets, hot-rolled, Gary	2.00	2.00	2.15	2.15
Sheets, cold-rolled, Gary.....	3.05	3.05	3.20	3.20
Sheets, No. 24 galv., Gary.....	3.50	3.50	3.50	3.50
Bright bess., basic wire, Pitts....	2.60	2.60	2.60	2.60
Tin plate, per base box, Pitts....	$5.00	$5.00	$5.00	$5.35
Wire nails, Pittsburgh	2.45	2.45	2.45	2.45

Semifinished Material

Sheet bars, Pittsburgh, Chicago..	$34.00	$34.00	$34.00	$34.00
Slabs, Pittsburgh, Chicago	34.00	34.00	34.00	34.00
Rerolling billets, Pittsburgh	34.00	34.00	34.00	34.00
Wire rods, No. 5 to $\frac{9}{32}$-inch, Pitts.	43.00	43.00	43.00	43.00

Pig Iron

	July 1, 1939	June, 1939	April, 1939	July, 1938
Bessemer, del. Pittsburgh	$22.34	$22.34	$22.34	$21.34
Basic, Valley	20.50	20.50	20.50	19.50
Basic, eastern, del. Philadelphia	22.34	22.34	22.34	21.34
No. 2, foundry, Pittsburgh	22.21	22.21	22.21	21.21
No. 2, foundry, Chicago	21.00	21.00	21.00	20.00
Southern No. 2, Birmingham ..	17.38	17.38	17.38	16.38
Southern No. 2 del. Cincinnati.	20.89	20.89	20.89	19.89
No. 2X, del. Phila. (differ. av.)..	23.215	23.215	23.215	22.215
Malleable, Valley	21.00	21.00	21.00	20.00
Malleable, Chicago	21.00	21.00	21.00	20.00
Lake Sup., charcoal, del. Chicago	28.34	28.34	28.34	28.34
Gray forge, del. Pittsburgh .. .	21.17	21.17	21.17	20.17
Ferromanganese,del. Pittsburgh	85.33	85.33	85.33	97.77

Scrap

Heavy melting steel, Pittsburgh.	$15.25	$15.00	$15.50	$13.75
Heavy melt. steel, No. 2, E. Pa...	13.25	13.125	13.65	12.20
Heavy melting steel, Chicago ...	13.25	13.40	13.35	12.05
Rails for rolling, Chicago . .	17.75	17.65	17.25	17.05
Railroad steel specialties, Chicago	15.50	15.30	15.35	14.95

Coke

Connellsville, furnace, ovens....	$3.75	$3.75	$3.75	$3.75
Connellsville, foundry, ovens ...	5.00	5.00	5.00	5.00
Chicago, by-product fdry., del...	10.50	10.50	10.50	10.80

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

Except when otherwise designated, prices are base, f.o.b. cars.

Sheet Steel

Hot Rolled

Pittsburgh	2.00c
Chicago, Gary	2.00c
Cleveland	2.00c
Detroit, del.	2.00c
Buffalo	2.00c
Sparrows Point, Md.....	2.00c
New York, del.	2.24c
Philadelphia, del.	2.17c
Granite City, Ill.....	2.10c
Middletown, O.	2.00c
Youngstown, O.	2.00c
Birmingham	2.00c
Pacific Coast points....	2.50c

Cold Rolled

Pittsburgh	3.05c
Chicago, Gary	3.05c
Buffalo	3.05c
Cleveland	3.05c
Detroit, delivered	3.15c
Philadelphia, del.....	3.37c
New York, del.	3.39c
Granite City, Ill.	3.15c
Middletown, O.	3.05c
Youngstown, O.	3.05c
Pacific Coast points....	3.65c

Galvanized No. 24

Pittsburgh	3.50c
Chicago, Gary	3.50c
Buffalo	3.50c
Sparrows Point, Md.	3.50c
Philadelphia, del.	3.67c
New York, delivered	3.74c
Birmingham	3.50c
Granite City, Ill.....	3.60c
Middletown, O.	3.50c
Youngstown, O.	3.50c
Pacific Coast points....	4.00c

Black Plate, No. 29 and Lighter

Pittsburgh	3.05c
Chicago, Gary	3.05c
Granite City, Ill.	3.15c

Long Ternes No. 24 Unassorted

Pittsburgh, Gary	3.80c
Pacific Coast	4.50c

Enameling Sheets

	No. 10	No. 20
Pittsburgh	2.75c	3.35c
Chicago, Gary..	2.75c	3.35c
Granite City, Ill.	2.85c	3.45c
Youngstown, O.	2.75c	3.35c
Cleveland	2.75c	3.35c
Middletown, O.	2.75c	3.35c
Pacific Coast...	3.35c	3.95c

Corrosion and Heat-Resistant Alloys

Pittsburgh base, cents per lb.

Chrome-Nickel

	No. 302	No. 304
Bars	24.00	25.00
Plates	27.00	29.00
Sheets	34.00	36.00
Hot strip	21.50	23.50
Cold strip	28.00	30.00

Straight Chromes

	No. 410	No. 430	No. 442	No. 446
Bars	18.50	19.00	22.50	27.50
Plates ..	21.50	22.00	25.50	30.50
Sheets	26.50	29.00	32.50	36.50
Hot strip	17.00	17.50	24.00	35.00
Cold stp..	22.00	22.50	32.00	52.00

Steel Plate

Pittsburgh	2.10c
New York, del. 2.19-2.29c	
Philadelphia, del.....	2.15c
Boston, delivered.....	2.42c
Buffalo, delivered	2.33c
Chicago or Gary	2.10c
Cleveland	2.10c
Birmingham	2.10c
Coatesville, base	2.10c
Sparrows Point, base....	2.10c
Claymont, del.	2.10c
Youngstown	2.10c
Gulf ports	2.45c
Pacific Coast points....	2.60c

Steel Floor Plates

Chicago	3.35c
Gulf ports	3.70c
Pacific Coast ports	3.95c
Pittsburgh	3.35c

Standard Shapes

Pittsburgh	2.10c
Philadelphia, del. 2.21½c	
New York, del.	2.27c
Boston, delivered	2.41c
Bethlehem	2.10c
Chicago	2.10c
Cleveland, del.	2.30c
Buffalo	2.10c
Gulf ports	2.45c
Birmingham	2.10c
St. Louis, del.	2.34c
Pacific Coast points....	2.70c

Tin and Terne Plate

Tin Plate, Coke (base box)

Pittsburgh, Gary, Chicago	$5.00
Granite City, Ill.	5.10

Mfg. Terne Plate (base box)

Pittsburgh, Gary, Chicago	$4.30
Granite City, Ill.	4.40

Bars

Soft Steel

(Base, 3 tons or over)

Pittsburgh	2.15c
Chicago or Gary	2.15c
Duluth	2.25c
Birmingham	2.15c
Cleveland	2.15c
Buffalo	2.15c
Detroit, delivered	2.25c
Philadelphia, del.	2.47c
Boston, delivered	2.52c
New York, del.	2.49c
Gulf ports	2.50c
Pacific Coast points....	2.75c

Rail Steel

(Base, 15 tons or over)

Pittsburgh	2.00c
Chicago or Gary	2.00c
Detroit, delivered	2.10c
Cleveland	2.00c

Buffalo	2.00c
Birmingham	2.00c
Gulf ports	2.35c
Pacific Coast points	2.60c

Iron

Chicago, Terre Haute	2.05c
Philadelphia	2.37c
Pittsburgh, refined	3.50-8.00c

Reinforcing

New billet, straight lengths, quoted by distributors

Chicago, Gary, Buffalo Cleve., Birm., Young., Sparrows Pt., Pitts.	1.80-2.05c
Detroit, delivered	1.90-2.15c
Gulf ports	2.20-2.40c
Pacific coast ports	2.50c
Philadelphia, del.	1.97-2.22c

Rail steel, straight lengths, quoted by distributors

Pittsburgh, Gary, Chicago, Buffalo, Cleveland, Birm.	1.75-1.90c
Detroit, delivered	1.85-2.00c
Gulf ports	2.10-2.25c
Pacific Coast	2.35c

Wire Products

Pitts.-Cleve.-Chicago-Birm. base per 100 lb. keg in carloads

Standard wire nails	$2.45
Cement coated nails	$2.45

(Per pound)

Polished staples	3.15c
Galv. fence staples	3.40c
Galv. barbed wire, standard 12½ gage two-point hog, 80-rod spool $2.80; two-point cattle, 80-rod spool	$2.62
Annealed fence wire	2.95c
Galv. fence wire	3.35c
Woven wire fencing (base C. L. column)	67.00
Single loop bale ties, (base C. L. column)	56.00

To Manufacturing Trade

Base, Pitts. - Cleve. - Chicago-Birmingham (except spring wire)

Bright bess., basic wire	2.60c
Galvanized wire	2.65c
Spring wire	3.20c

Worcester, Mass., $2 higher on bright basic and spring wire.

Cut Nails

Carloads, Pittsburgh $3.60

Cold-Finished Bars

	Carbon	Alloy
Pittsburgh	2.65c	3.35c
Chicago	2.65c	3.35c
Gary, Ind.	2.65c	3.35c
Detroit	2.70c	*3.45c
Cleveland	2.65c	3.35c
Buffalo	2.65c	3.35c

*Delivered.

Alloy Bars (Hot)

(Base, 3 tons or over)

Pittsburgh, Buffalo, Chicago, Massillon, Canton, Bethlehem	2.70c
Detroit, delivered	2.80c

S.A.E.	Alloy Diff.	S.A.E.	Alloy Diff.
2000	0.35	3100	0.70
2100	0.75	3200	1.35
2300	1.55	3300	3.80
2500	2.25	3400	3.20
4100	0.15 to 0.25 Mo.		0.55
4600	0.20 to 0.30 Mo. 1.50-2.00 Ni.		1.10
5100	0.80-1.10 Cr.		0.45
5100	Cr. spring flats		0.15
6100	bars		1.20
6100	spring flats		0.85
Cr. N., Van.			1.50
Carbon Van.			0.85
9200	spring flats		0.15
9200	spring rounds, squares		0.40

Electric furnace up 50 cents.

Strip and Hoops

(Base, hot strip, 1 ton or over; cold, 3 tons or over)

Hot Strip, 12-inch and less

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, Birmingham	2.00c
Detroit, del.	2.10c
Philadelphia, del.	2.32c
New York, del.	2.36c
Cooperage hoop, Youngs., Pitts.; Chicago, Birm.	2.10c
Cold strip, 0.25 carbon and under, Pittsburgh, Cleveland, Youngstown	2.80c
Chicago	2.90c
Detroit, del.	2.90c
Worcester, Mass.	3.00c

Carbon	Cleve., Pitts.
0.26—0.50	2.80c
0.51—0.75	4.30c
0.76—1.00	6.15c
Over 1.00	8.35c

Worcester, Mass $4 higher.

Commodity Cold-Rolled Strip

Pitts.-Cleve.-Youngstown	2.95c
Detroit, del.	3.05c
Worcester, Mass.	3.35c

Lamp stock up 10 cents.

Rails, Fastenings

(Gross Tons)

Standard rails, mill	$40.00
Relay rails, Pittsburgh 20—100 lbs.	32.50-35.50
Light rails, billet qual., Pitts., Chicago, B'ham.	$40.00
Do., rerolling quality	39.00

Cents per pound

Angle bars, billet, mills	2.70c
Do., axle steel	2.35c
Spikes, R. R. base	3.00c
Track bolts, base	4.15c
Car axles forged, Pitts., Chicago, Birmingham.	3.15c
Tie plates, base	2.15c

Base, light rails 25 to 60 lbs., 20 lbs., up $2; 16 lbs. up $4; 12 lbs. up $8; 8 lbs. up $10. Base railroad spikes 200 kegs or more; base plates 20 tons.

Bolts and Nuts

Pittsburgh, Cleveland, Birmingham, Chicago. Discounts to legitimate trade as per Dec. 1, 1932, lists, carloads 5% up; full containers additional 10%.

Carriage and Machine

½ x 6 and smaller	68.5 off
Do. larger, to 1-in.	66 off
Do. 1⅛ and larger	64 off
Tire bolts	52.5 off

Stove Bolts

In packages with nuts attached 72.5 off; in packages with nuts separate 72.5-12½ off; bulk 84 off on 15,000 of 3-inch and shorter, or 5000 over 3-in.

Step bolts	60 off
Elevator bolts	60 off
Plow bolts	68.5 off

Nuts

Semifinished hex.	U.S.S.	S.A.E.
6-inch and less	67	70
⅞-1-inch	64	65
1⅛ and larger	62	62

Hexagon Cap Screws

Upset, 1-in., smaller 67.5 off

Square Head Set Screws

Upset, 1-in., smaller	75.0 off
Headless set screws	70.0 off

Piling

Pitts., Chgo., Buffalo	2.40c
Gulf ports	2.75c

Rivets, Washers

Structural, Pittsburgh, Cleveland, Chicago	3.40c
⅞-inch and smaller, 11 and 12	63⅛ 54
Pitts., Chi., Cleve.	65-10 off
Wrought washers, Pitts., Chi., Phila., to jobbers and large nut, bolt mfrs. l.c.l. $5.40; c.l. $5.75 off	

Welded Iron, Steel Pipe

Base discounts on steel pipe. Pitts., Lorain, O., to consumers in carloads. Gary, Ind., 2 points less on lap weld, 1 point less on butt weld. Chicago delivery 2½ and 1½ less, respectively. Wrought pipe, Pittsburgh base.

Butt Weld

Steel

In.	Blk.	Galv.
⅛	63⅛	54
¼	66⅛	58
1—3	68⅛	60⅛

Iron

¼	30	13
1—1¼	34	19
1½	38	21⅛
2	37⅛	21

Lap Weld

Steel

2	61	52⅛
2½—3	64	55⅛
3½—6	66	57⅛
7 and 8	65	55⅛
9 and 10	64⅛	55

Iron

2	30⅛	15
2½—3½	31⅛	17⅛
4	33⅛	21
4½—8	32⅛	20
9—12	28⅛	15

Line Pipe

Steel

1 to 3, butt weld	67⅛	
2, lap weld	60	
2½ to 3, lap weld	63	
3½ to 6, lap weld	65	
7 and 8, lap weld	64	
10-inch lap weld	63⅛	
12-inch, lap weld	62⅛	

Iron

	Blk.	Galv.
¾ butt weld	25	7
1 and 1¼ butt weld	29	13
1½ butt weld	33	15⅛
2 butt weld	32⅛	15
1½ lap weld	23⅛	7
2 lap weld	25⅛	9
2½ to 3½ lap weld	26⅛	11⅛
4 lap weld	28⅛	15
4½ to 8 lap weld	27⅛	14
9 to 12 lap weld	23⅛	9

Boiler Tubes

Carloads minimum wall seamless steel boiler tubes, cut lengths 4 to 24 feet; f.o.b. Pittsburgh, base price per 100 feet subject to usual extras.

Lap Welded

Sizes	Gage	Steel	Charcoal Iron
1½" O. D.	13	$ 9.72	$23.71
1¾" O. D.	13	11.06	22.93
2" O. D.	13	12.38	19.35
2¼" O. D.	13	13.79	21.68
2¼" O. D.	12	15.16	.....
2½" O. D.	12	16.58	26.57
2¾" O. D.	12	17.54	29.00
3" O. D.	12	18.35	31.36
3½" O. D.	11	23.15	39.81
4" O. D.	10	28.66	49.90
5" O. D.	9	44.25	73.93
6" O. D.	7	68.14	.....

Seamless

Sizes	Gage	Hot Rolled	Cold Drawn
1" O. D.	13	$ 7.82	$ 9.01
1¼" O. D.	13	9.26	10.67
1½" O. D.	13	10.23	11.79
1¾" O. D.	13	11.64	13.42
2" O. D.	13	13.04	15.03
2¼" O. D.	13	14.54	16.76
2¼" O. D.	12	16.01	18.45
2½" O. D.	12	17.54	20.21
2¾" O. D.	12	18.59	21.42
3" O. D.	12	19.50	22.48
3½" O. D.	11	24.62	28.37
4" O. D.	10	30.54	35.20
4½" O. D.	10	37.35	43.04
5" O. D.	9	46.87	54.01
6" O. D.	7	71.96	82.93

Cast Iron Pipe

Class B Pipe—Per Net Ton

6-in., & over, Birm.	$42.00-43.00
4-in., Birmingham	45.00-46.00
4-in., Chicago	53.80-54.80
6-in. & over, Chicago	50.80-51.80
6-in. & over, east fdy.	46.00
Do., 4-in.	49.00

Class A Pipe $3 over Class B
Stnd. fitgs., Birm., base $100.00

Semifinished Steel

Rerolling Billets, Slabs

(Gross Tons)

Pittsburgh, Chicago, Gary, Cleve., Buffalo, Young., Birm., Sparrows Point	$34.00
Duluth (billets)	36.00
Detroit, delivered	36.00

Forging Quality Billets

Pitts., Chi., Gary, Cleve., Young., Buffalo, Birm.	40.00
Duluth	42.00

Sheet Bars

Pitts., Cleveland, Young., Sparrows Point, Buffalo, Canton, Chicago	34.00
Detroit, delivered	36.00

Wire Rods

Pitts., Cleveland, Chicago, Birmingham No. 5 to ⅜-inch incl.	43.00
Do., over ⅜ to 41/64-in. incl.	48.00

Worcester up $2; Galveston up $6; Pacific Coast up $9.

Skelp

Pitts., Chi., Young., Buff., Coatesville, Sparrows Pt.	1.90c

Coke

Price Per Net Ton

Beehive Ovens

Connellsville, fur.	$3.75
Connellsville, fdry.	4.75- 5.50
Connell. prem. fdry.	5.75- 6.25
New River fdry.	6.50- 6.75
Wise county fdry.	5.50- 5.75
Wise county fur.	4.50- 4.75

By-Product Foundry

Newark, N. J., del.	10.88-11.35
Chi., ov., outside del.	9.75
Chicago, del.	10.50
Terre Haute, del.	10.00
Milwaukee, ovens	10.50
New England, del.	12.50
St. Louis, del.	11.00-11.50
Birmingham, ovens	7.00
Indianapolis, del.	10.00
Cincinnati, del.	9.75
Cleveland, del.	10.30
Buffalo, del.	10.50
Detroit, del.	10.25
Philadelphia, del.	10.65

Coke By-Products

Spot, gal., freight allowed east of Omaha

Pure and 90% benzol	16.00c
Toluol, two degree	22.00c
Solvent naphtha	26.00c
Industrial xylol	26.00c

Per lb. f.o.b. Frankford and St. Louis

Phenol (200 lb. drums)	16.25c
Do. (450 lbs.)	15.25c

Eastern Plants, per lb.

Naphthalene flakes, balls, bbls. to jobbers	5.75c

Per ton, bulk, f.o.b. port	
Sulphate of ammonia	$28.00

Pig Iron

Delivered prices include switching charges only as noted. No. 2 foundry is 1.75-2.25 sil.; 25c diff. for each 0.25 sil. above 2.25 sil.; 50c diff. below 1.75 sil. Gross tons.

Basing Points:	No. 2 Fdry.	Malleable	Basic	Bessemer
Bethlehem, Pa.	$22.00	$22.50	$21.50	$23.00
Birdsboro, Pa.	22.00	22.50	21.50	23.00
Birmingham, Ala.‡	17.38	.....	16.38	22.00
Buffalo	21.00	21.50	20.00	22.00
Chicago	21.00	21.00	20.50	21.50
Cleveland	21.00	21.00	20.50	21.50
Detroit	21.00	21.00	20.50	21.50
Duluth	21.50	21.50	.....	22.00
Erie, Pa.	21.00	21.50	20.50	22.00
Everett, Mass.	22.00	22.50	21.50	23.00
Granite City, Ill.	21.00	21.00	20.50	21.50
Hamilton, O.	21.00	21.00	20.50	.....
Neville Island, Pa.	21.00	21.00	20.50	21.50
Provo, Utah	19.00	.....	.....	.....
Sharpsville, Pa.	21.00	21.00	20.50	21.50
Sparrow's Point, Md.	22.00	.....	21.50	.....
Swedeland, Pa.	22.00	22.50	21.50	23.00
Toledo, O.	21.00	21.00	20.50	21.50
Youngstown, O.	21.00	21.00	20.50	21.50

‡Subject to 38 cents deduction for 0.70 per cent phosphorus or higher.

Delivered from Basing Points:

Akron, O., from Cleveland	22.39	22.39	21.89	22.89
Baltimore from Birmingham	22.78	.....	21.66	.....
Boston from Birmingham	22.12	.....	.....	.....
Boston from Everett, Mass.	22.50	23.00	22.00	23.50
Boston from Buffalo	22.50	23.00	22.00	23.50
Brooklyn, N. Y., from Bethlehem	24.50	25.00	.....	.....
Canton, O., from Cleveland	22.39	22.39	21.89	22.89
Chicago from Birminghom	†21.22	.....	.....	.....
Cincinnati from Hamilton, O.	21.24	22.11	21.61	.....
Cincinnati from Birmingham	21.06	.....	20.06	.....
Cleveland from Birmingham	21.32	.....	20.82	.....
Mansfield, O., from Toledo, O.	22.94	22.94	22.44	22.44
Milwaukee from Chicago	22.10	22.10	21.60	22.60
Muskegon, Mich., from Chicago, Toledo or Detroit	24.19	24.19	23.69	24.69
Newark, N. J., from Birmingham	23.15	.....	.....	.....
Newark, N. J., from Bethlehem	23.53	24.03	.....	.....
Philadelphia from Birmingham	22.46	.....	21.96	.....
Philadelphia from Swedeland, Pa.	22.84	23.34	22.34	.....
Pittsburgh district from Neville Island	Neville base, plus 69c, 84c, and $1.24 freight.			
Saginaw, Mich., from Detroit	23.45	23.45	22.95	22.95
St. Louis, northern	21.50	21.50	21.00	.....
St. Louis from Birmingham	†21.12	.....	20.62	.....
St. Paul from Duluth	23.63	23.63	.....	24.13

†Over 0.70 phos.

Low Phos.

Basing Points: Birdsboro and Steelton, Pa., and Standish, N. Y., $26.50, base; $27.74 delivered Philadelphia.

Gray Forge		Charcoal	
Valley furnace	$20.50	Lake Superior fur.	$25.00
Pitts. dist. fur.	20.50	do., del Chicago	28.34
		Lyles, Tenn.	23.50

†Silvery

Jackson county, O., base: 6-6.50 per cent $25.50; 6.51-7—$26.00; 7-7.50—$26.50; 7.51-8—$27.00; 8-8.50—$27.50; 8.51-9—$28.00; 9-9.50—$28.50; Buffalo, $1.25 higher.

Bessemer Ferrosilicon†

Jackson county, O., base; Prices are the same as for silveries, plus $1 a ton.

†The lower all-rail delivered price from Jackson, O., or Buffalo is quoted with freight allowed.

Manganese differentials in silvery iron and ferrosilicon, 2 to 3%, $1 per ton add. Each unit over 3%, add $1 per ton.

Refractories

Per 1000 f.o.b. Works, Net Prices

Fire Clay Brick

Super Quality

Pa., Mo., Ky.	$60.80

First Quality

Pa., Ill., Md., Mo., Ky.	47.50
Alabama, Georgia	47.50
New Jersey	52.50

Second Quality

Pa., Ill., Ky., Md., Mo.	42.75
Georgia, Alabama	34.20
New Jersey	49.00

Ohio

First quality	39.90
Intermediate	36.10
Second quality	31.35

Malleable Bung Brick

All bases	$56.05

Silica Brick

Pennsylvania	$47.50
Joliet, E. Chicago	55.10
Birmingham, Ala.	47.50

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry press	$28.00
Wire cut	$26.00

Magnesite

Imported dead - burned grains, net ton f.o.b. Chester, Pa., and Baltimore bases (bags)	$45.00
Do. domestic	40.00
Do., f.o.b. Chewelah, Wash., net ton, bulk	22.00
net ton, bags	26.00
Quickset magnesite grains, f.o.b. Chewelah, Wash., net, bulk	22.00

Basic Brick

Net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick	$47.00
Chem. bonded chrome	47.00
Magnesite brick	67.00
Chem. bonded magnesite	57.00

Fluorspar, 85-5

Washed gravel, duty pd., tide, net ton	$21.00-21.50
Washed gravel, f.o.b. Ill., Ky., net ton, carloads, all rail	18.00
Do. barge	19.00
No. 2 lump	18.00-19.00

Ferroalloy Prices

Ferromanganese, 78-82%, tidewater, duty pd. $80.00
Do., del. Pittsburgh 85.33

Spiegeleisen, 19-21% dom. Palmerton, Pa., spot 28.00
Do., 26-28%, Palmerton 33.00

Ferrosilicon, 50% freight allowed, c.l. 69.50
Do., ton lot 80.50
Do., 75 per cent 126.00
Spot, $5 a ton higher.

Silicoman, 2½ carbon 88.00
2% carbon, 93.00; 1%, 103.00
Contract ton price $11 higher; spot $5 over contract.

Ferrotungsten, stand., lb. con. del. cars 1.60-1.65

Ferrovanadium, 35 to 40%, lb., cont. 2.70-2.80-2.90

Ferrophosphorus, gr. ton, c.l., 17-18% Rockdale, Tenn., basis, 18%, $3 unitage, 58.50; electrolytic, per ton, c. l., 23-26% f.o.b. Monsanto, Tenn., 24% $3 unitage 75.00

Ferrochrome, 66-70 chromium, 4-6 carbon, cts. lb., contained cr., del. carlots 10.50c
Do., ton lots 11.25c
Do., less-ton lots 11.50c

67-72% carloads, 2% carbon, per lb. contained chrome 16.50c
Do., ton lots 17.25c
Do., less-ton lots 17.75c

	Carloads	Ton lots	Less ton
2% carb.	16.50c	17.25c	17.50c
1% carb.	17.50c	18.25c	18.50c
0.10% carb.	18.50c	19.25c	19.50c
0.20% carb.	19.50c	20.25c	20.50c

Spot ¼c higher

Ferromolybdenum, 55-65% molyb. cont., f.o.b. mill, lb. 0.95

Calcium molybdate, lb. molyb. cont., f.o.b. mill 0.80

Ferrotitanium, 40-45%, lb., con. ti., f.o.b. Niagara Falls, ton lots $1.23
Do., less-ton lots 1.25
20-25% carbon, 0.10 max., ton lots, lb. 1.35
Do, less-ton lots 1.40
Spot 5c higher

Ferrocolumbium, 50-60%, contract, lb. con. col., f.o.b. Niagara Falls $2.25
Do, less-ton lots 2.30
Spot is 10c higher

Technical molybdenum trioxide, 53 to 60% molybdenum, lb. molyb. cont., f.o.b. mill 0.80

Ferro-carbon-titanium, 15-18%, ti., 6-8% carb., carlots, contr., net ton $142.50
Do, spot 145.00
Do, contract, ton lots 145.00
Do, spot, ton lots 150.00

15-18% ti., 3-5% carbon, carlots, contr., net ton 157.50
Do, spot 160.00
Do, contract, ton lots 160.00
Do, spot, ton lots 165.00

Alsifer, contract carlots, f.o.b. Niagara Falls, lb. 7.50c
Do, ton lots 8.00c
Do, less-ton lots 8.50c
Spot ½c lb. higher

Chromium Briquets, contract, any quantity, freight allowed, lb. 7.25c
Do, spot carlots, bulk 7.50c
Do, ton lots 8.00c
Do., less-ton lots 8.25c

Tungsten Metal Powder, according to grade, spot shipment, 200-lb. drum lots, lb. $2.00
Do, smaller lots 2.10

Vanadium Pentoxide, contract, lb. contained $1.10
Do, spot 1.15

Chromium Metal, 98% cr., 0.50 carbon max., contract, lb. con. chrome 80.00c
Do, spot 85.00c
88% chrome, contract 79.00c
Do, spot 84.00c

Silicon Metal, 1% iron, contract, carlots, 2 x ⅛-in., lb. 14.00c
Do, 2% 12.50c
Spot ¼c higher

Silicon Briquets, contract carloads freight allowed, ton $69.50
Carload, spot 74.50
Less-ton lots, lb. 3.75c

Manganese Briquets, contract carloads, bulk freight allowed, lb. 4.50c
Ton lots 5.00c
Less-ton lots 5.25c
Spot ¼c higher

Zirconium Alloy, 12-15%, contract, carloads, gross ton $97.50
Do, spot 102.50
34-40%, contract, carloads, lb., alloy 14.00c
Do, ton lots 15.00c
Do, less-ton lots 16.00c
Spot ¼c higher

Molybdenum Powder, 99%, f.o.b. York, Pa. 200-lb. kegs, lb. $2.60
Do, 100-200 lb. lots 2.75
Do, under 100-lb. lots 3.00

Molybdenum Oxide Briquets, 48-52% molybdenum, per pound contained, f.o.b. producers' plant 80.00c

WAREHOUSE STEEL PRICES

Base Prices in Cents Per Pound, Delivered Locally, Subject to Prevailing Differentials

	Soft Bars	Bands	Hoops	Plates ¼-in. & Over	Structural Shapes	Floor Plates	Sheets: Hot Rolled	Sheets: Cold Rolled	Sheets: Galv. No. 24	Cold Rolled Strip	Cold Drawn Bars: Carbon	Cold Drawn Bars: SAE 2300	Cold Drawn Bars: SAE 3100
Boston	3.88	4.06	5.06	3.85	3.85	5.66	3.71	4.78	4.61	3.46	4.13	8.63	7.23
New York (Met.)	3.84	3.96	3.96	3.76	3.75	5.56	3.40	4.60	4.50	3.51	4.09	8.59	7.19
Philadelphia	3.60	3.60	4.10	3.40	3.40	5.00	3.40	4.55	4.28	3.51	4.06	8.56	7.16
Baltimore	3.70	3.85	3.80	3.55	3.55	5.00	3.55	4.90	5.05	....	4.05	....	....
Norfolk, Va.	3.90	4.00	....	3.75	3.75	5.20	3.75	....	5.40	....	4.15	....	....
Buffalo	3.35	3.82	3.82	3.62	3.40	5.25	3.35	4.40	4.40	3.42	3.75	8.15	6.75
Pittsburgh	3.35	3.60	3.60	3.40	3.40	5.00	3.35	....	4.50	3.35	3.65	8.35	6.95
Cleveland	3.25	3.50	3.50	3.40	3.58	5.18	3.35	4.55	4.62	3.20	3.75	8.15	6.75
Detroit	3.33	3.43	3.68	3.60	3.65	5.27	3.43	4.50	4.59	3.40	3.80	8.45	7.05
Cincinnati	3.60	3.67	3.67	3.65	3.68	5.28	3.42	....	4.57	3.45	4.00	8.50	7.10
Chicago	3.50	3.60	3.60	3.55	3.55	5.15	3.35	4.30	4.25	3.50	3.75	8.15	6.75
Twin Cities	3.75	3.85	3.85	3.80	3.80	5.40	3.60	4.95	4.50	3.83	4.34	8.84	7.44
Milwaukee	3.63	3.73	3.73	3.68	3.68	5.28	3.48	4.43	4.38	....	3.88	8.38	6.98
St. Louis	3.62	3.72	3.72	3.47	3.47	5.07	3.38	4.32	4.52	3.61	4.02	8.52	7.12
Kansas City	4.05	4.15	4.15	4.00	4.00	5.60	3.90	....	5.00	....	4.30	....	....
Memphis	3.90	4.00	4.00	3.95	3.95	5.71	3.75	....	5.00	....	4.31	....	....
Chattanooga	3.80	3.90	3.90	3.85	3.85	5.80	3.65	....	4.40	....	4.39	....	....
Tulsa, Okla.	4.54	4.64	4.64	4.41	4.41	6.01	4.32	....	5.39	....	4.79	....	....
Birmingham	3.50	3.60	3.60	3.55	3.55	5.88	3.35	....	4.85	....	4.43	....	....
New Orleans	3.85	4.65	4.65	3.80	3.80	5.75	4.10	....	4.60	5.00	5.10	....	....
Houston, Tex.	3.50	5.85	6.25	4.05	4.05	5.65	3.95	....	5.25	....	....	....	....
Seattle	3.65	3.85	5.20	3.40	3.50	5.25	3.70	....	4.75	....	5.60	....	....
Portland, Oreg.	4.00	4.40	6.10	4.00	4.00	5.50	3.95	6.50	4.75	....	5.60	....	....
Los Angeles	4.00	4.50	6.35	4.00	4.00	6.20	4.20	6.30	5.00	4.45	6.00	10.40	9.55
San Francisco	3.50	3.90	6.00	3.45	3.45	5.05	3.45	6.40	5.15	7.30	6.55	10.65	9.80

	SAE Hot-rolled Bars (Unannealed): 1035-1050	2300 Series	3100 Series	4100 Series	6100 Series
Boston	4.18	7.50	6.05	5.80	7.90
New York (Met.)	4.04	7.35	5.90	5.65	....
Philadelphia	3.85	7.31	5.86	5.61	7.71
Baltimore	3.85	....	....	....	....
Norfolk, Va.	....	....	....	....	....
Buffalo	3.55	7.10	5.65	5.40	7.50
Pittsburgh	3.40	7.35	5.95	5.50	7.60
Cleveland	3.30	7.30	5.85	5.85	7.70
Detroit	3.38	7.42	5.97	5.72	7.19
Cincinnati	3.65	7.44	5.99	5.74	7.84
Chicago	3.70	7.10	5.65	5.40	7.50
Twin Cities	3.95	7.45	6.00	6.09	8.19
Milwaukee	3.78	7.33	5.88	5.63	7.73
St. Louis	3.82	7.47	6.02	5.77	7.87
Seattle	5.65	....	7.80	7.65	8.45
Portland, Oreg.	6.10	9.00	8.00	7.85	8.70
Los Angeles	4.65	9.40	8.55	8.40	9.05
San Francisco	4.50	9.65	8.80	8.65	9.30

BASE QUANTITIES

Soft Bars, Bands, Hoops, Plates, Shapes, Floor Plates and SAE 1035-1050 Bars: Base, 400-1999 pounds, except 400-14,999 pounds in Twin Cities; 400-3999 pounds in Birmingham; 0-299 pounds (hoops only) in San Francisco; 300-1999 in Los Angeles.

Hot Rolled Sheets: Base, 400-1999 pounds, except 0-1999 pounds in New York; 400-14 999 pounds in Twin Cities; 400-3999 pounds in Birmingham; 300-1999 in Los Angeles.

Cold Rolled Sheets: Base, 400-1499 pounds in Chicago, Cincinnati, Cleveland, New York and St. Louis; 400-1499 pounds in Detroit; 450-3749 pounds in Boston; 500-1499 pounds in Buffalo; 1000-1999 pounds in Philadelphia; 300-4999 pounds in San Francisco; any quantity in Twin Cities.

Galvanized Sheets: Base, 0-1499 pounds in New York and Tulsa; 150-1499 pounds in Cleveland; 1-9 bundles in Baltimore and Norfolk; 1-6 bundles in Los Angeles; 300-4999 pounds in San Francisco; 450-3749 pounds in Boston; 500-1499 pounds in Birmingham, Chicago, Cincinnati, Detroit and St. Louis; 1500 pounds and over in Chattanooga and Philadelphia.

Cold Rolled Strip: No base quantity; extras apply on lots of all size.

Cold Finished Bars: Base, 1000 pounds and over, except 0-299 pounds in San Francisco.

SAE Hot Rolled Alloy Bars: Base, 1000 pounds and over, except 0-4999 pounds in San Francisco.

CURRENT IRON AND STEEL PRICES OF EUROPE

Dollars at Rates of Exchange, June 29

Export Prices f. o. b. Port of Dispatch—

By Cable or Radio

	British gross tons U. K. ports £ s d	Quoted in dollars at current value	Continental Channe or North Sea ports, gross tons **Quoted in gold pounds sterling £ s d
Foundry, 2.50-3.00 Si.	$23.40 5 0 0	$18.32	2 3 0
Basic bessemer	....	19.81	2 6 6
Hematite, Phos. .03-.05	23.57 5 5 0*	.....	.....
Billets	$34.52 7 7 6	$38.34	4 10 0
Wire rods, No. 5 gage	53.24 11 7 6	43.67	5 2 6
Standard rails	$44 46 9 10 0	$48.99	5 15 0
Merchant bars	2.30c 11 0 0	1.95c to 1.98c	5 2 6 to 5 4 0
Structural shapes	2.09c 10 0 0	1.76c to 1.85c	4 12 6 to 4 17 6
Plates, †¼ in. or 5 mm.	2.29c 10 18 9	2.14c to 2.33c	5 12 6 to 6 2 6
Sheets, black, 24 gage or 0.5 mm.	2.72c 13 0 0	2.95c	7 15 0*
Sheets, gal., 24 ga., corr.	3.29c 15 15 0	3.47c	9 2 6
Bands and strips	2.77c 13 5 0	1.95c to 2.00c	5 2 6 to 5 5 0
Plain wire, base	4.08c 19 10 0	2.33c to 2.76c	6 2 6 to 7 5 0
Galvanized wire, base	4.86c 23 5 0	2.99c to 3.09c	7 17 6 to 8 2 6
Wire nails, base	....	2.66c to 2.85c	7 0 0 to 7 10 0
Tin plate, box 108 lbs.	$ 4.74 1 0 3	....	.....

British ferromanganese $80.00 delivered Atlantic seaboard duty-paid.

Domestic Prices at Works or Furnace—

Last Reported

	£ s d		French Francs		Belgian Francs		Reich Mark
Fdy. pig iron, Si. 2.5	$23.17	4 19 0(a)	$17.99	678.75	$16.15	475	$25.28	63
Basic bess. pig iron	21.65	4 12 6(a)	.....	....	.....	...	27.89 (b)	69.50
Furnace coke	5.38	1 4 2	5.96	225	6.87	202	7.62	19
Billets	34.52	7 7 6	26.79	1,011	29.24	860	38.73	96.50
Standard rails	1.99c	9 10 0	1.56c	1,300	2.06c	1,375	2.38c	132
Merchant bars	2.42c	11 12 0††	1.54c	1,282	1.65c	1,100	1.98c	110
Structural shapes	2.17c	10 8 0††	1.50c	1,247	1.65c	1,100	1.93c	107
Plates, †¼-in. or 5 mm.	2.29c	10 19 3††	1.95c	1,623	2.06c	1,375	2.29c	127
Sheets, black	3.08c	14 15 0§	2.31c	1,925‡	2.36c	1,575‡	2.59c	144‡
Sheets, galv., corr., 24 ga. or 0.5 mm.	3.61c	17 5 0	3.30c	2,750	4.13c	2,750	6.66c	370
Plain wire	4.08c	19 10 0	2.26c	1,880	2.48c	1,650	3.11c	173
Bands and strips	2.58c	12 7 0††	1.70c	1,420	1.95c	1,300	2.29c	127

*Basic. †British ship-plates. Continental, bridge plates. §24 ga. ‡1 to 3 mm. basic price. British quotations are for basic open-hearth steel. Continent usually for basic-bessemer steel. (a) del. Middlesbrough. 5s rebate to approved customers. (b) hematite. °Close annealed. ††Rebate of 15s on certain conditions.

**Gold pound sterling carries a premium of 75 per cent over paper sterling.

IRON AND STEEL SCRAP PRICES

Corrected to Friday night. Gross tons delivered to consumers, except where otherwise stated; †indicates brokers prices

HEAVY MELTING STEEL

Birmingham, No. 1	†12.00
Bos. dock No. 1 exp.	13.75-14.00
New Eng. del. No. 1	14.00
Buffalo, No. 1, R. R.	13.50-14.00
Buffalo, No. 1	13.00-13.50
Buffalo, No. 2	11.00-11.50
Chicago, No. 1	13.25-13.50
Chicago, auto, no alloy	11.75-12.25
Chicago, No. 2 auto	10.50-11.00
Cincinnati, dealers	11.00-11.50
Cleveland, No. 1	13.75-14.25
Cleveland, No. 2	12.50-13.00
Detroit, No. 1	10.00-10.50
Detroit, No. 2	9.50-10.00
Eastern Pa., No. 1	15.50
Eastern Pa., No. 2	13.00-13.50
Federal, Ill.	11.25-11.75
Granite City, R. R.	11.25-11.75
Granite City, No. 2	10.50-11.00
Los Angeles, No. 1	12.50
Los Angeles, No. 2	11.00-11.50
L. A., No. 1 f.a.s.	14.50
L. A., No. 2 f.a.s.	13.25
N. Y. dock No. 1 exp.	12.00-12.50
Pitts., No. 1 (R. R.)	16.00-16.50
Pittsburgh, No. 1	15.00-15.50
Pittsburgh, No. 2	13.50-14.00
St. Louis, R. R.	11.50-12.00
St. Louis, No. 2	10.50-11.00
San Francisco, No. 1	13.00-13.50
Seattle, No. 1	11.00-12.00
Toronto, dirs. No. 1	9.25- 9.75
Valleys, No. 1	14.50-15.00

COMPRESSED SHEETS

Buffalo	11.00-11.50
Chicago, factory	12.25-12.75
Chicago, dealers	11.00-11.50
Cincinnati dealers	10.50-11.00
Cleveland	13.75-14.25
Detroit	11.25-11.75
E. Pa., new mat.	15.50
E. Pa., old mat.	11.50-12.00
Los Angeles	14.00-14.50
Pittsburgh	15.00-15.50
St. Louis	9.50-10.00
Valleys	14.00-14.50

BUNDLED SHEETS

Buffalo, No. 1	11.00-11.50
Buffalo, No. 2	10.00-10.50
Cleveland	9.50-10.00
Los Angeles	14.00
Pittsburgh	13.75-14.25
St. Louis	7.00- 7.50
Toronto, dealers	8.00- 8.50

SHEET CLIPPINGS, LOOSE

Chicago	8.00- 8.50
Cincinnati, dealers	6.50- 7.00
Detroit	8.00- 8.50
†Los Angeles	3.75- 4.00
St. Louis	6.00- 6.50
Toronto, dealers	4.25- 4.75

BUSHELING

Buffalo, No. 1	11.00-11.50
Chicago, No. 1	11.75-12.25
Cincin., No. 1, deal.	7.00- 7.50
Cincinnati, No. 2	2.25- 2.75
Cleveland, No. 2	7.50- 8.00
Detroit, No. 1, new	10.00-10.50
Valleys, new, No. 1	13.50-14.00
Toronto, dealers	3.75- 4.25

MACHINE TURNINGS (Long)

Birmingham	†4.50- 5.00
Buffalo	6.00- 6.50
Chicago	7.00- 7.50
Cincinnati, dealers	4.50- 5.00
Cleveland, no alloy	7.25- 7.75
Detroit	5.00- 5.50
Eastern Pa.	8.50- 9.00
Los Angeles	4.50- 5.00
New York	†3.50- 4.00
Pittsburgh	9.00- 9.50
St. Louis	4.50- 5.00
Toronto, dealers	4.25- 4.75
Valleys	9.00- 9.50

SHOVELING TURNINGS

Buffalo	7.25- 7.75
Cleveland	7.50- 8.00
Chicago	7.00- 7.50
Chicago, spcl. anal.	8.00- 8.50
Detroit	6.00- 6.50
Pitts., alloy-free	10.25-10.75

BORINGS AND TURNINGS

For Blast Furnace Use

Boston district	2.00
Buffalo	6.75- 7.25
Cincinnati, dealers	3.25- 3.75
Cleveland	7.50- 8.00
Eastern Pa.	6.50- 7.00
Detroit	5.00- 5.50
New York	†2.50- 3.00
Pittsburgh	6.50- 7.00
Toronto, dealers	3.50- 4.00

AXLE TURNINGS

Boston district	†7.50
Buffalo	9.50-10.00
Chicago, elec. fur.	13.50-14.00
East. Pa., elec. fur.	13.00-13.50
St. Louis	9.00- 9.50
Toronto	4.00- 4.25

CAST IRON BORINGS

Birmingham	†6.00- 6.50
Boston dist. chem.	†4.50
Buffalo	6.75- 7.25
Chicago	6.50- 7.00
Cincinnati, dealers	3.25- 3.75
Cleveland	7.50- 8.00
Detroit	5.00- 5.50
E. Pa., chemical	10.00-11.00
New York	†3.50- 4.00
St. Louis	2.50- 3.00
Toronto, dealers	3.75- 4.25

RAILROAD SPECIALTIES

Chicago	15.25-15.75

ANGLE BARS—STEEL

Chicago	15.25-15.75
St. Louis	13.00-13.50

SPRINGS

Buffalo	15.50-16.00
Chicago, coil	16.50-17.00
Chicago, leaf	15.00-15.50
Eastern Pa.	18.00
Pittsburgh	18.00-18.50
St. Louis	14.00-14.50

STEEL RAILS, SHORT

Birmingham	†12.00-12.50
Buffalo	16.50-17.00
Chicago (3 ft.)	16.00-16.50
Chicago (2 ft.)	16.50-17.00
Cincinnati, dealers	16.75-17.25
Detroit	16.50-17.00
Los Angeles	15.00-15.50
Pitts., 3 ft. and less	18.50-19.00
St. Louis, 2 ft. & less	16.25-16.75

STEEL RAILS, SCRAP

Boston district	†13.50-14.00
Buffalo	15.50-16.00
Chicago	13.50-14.00
Cleveland	16.50-17.00
Pittsburgh	16.00-16.50
St. Louis	13.00-13.50
Seattle	16.00

FROGS, SWITCHES

Chicago	13.50-14.00
St. Louis, cut	13.00-13.50

ARCH BARS, TRANSOMS

St. Louis	13.50-14.00

PIPE AND FLUES

Chicago, net	8.50- 9.00
Cincinnati, dealers	6.50- 7.00

RAILROAD GRATE BARS

Buffalo	9.00- 9.50
Chicago, net	7.50- 8.00
Cincinnati, dealers	6.25- 6.75
Eastern Pa.	12.50-13.00
New York	†8.50- 9.00
St. Louis	8.00- 8.50

RAILROAD WROUGHT

Birmingham	†11.00-11.50
Boston district	†9.50-10.00
Eastern Pa., No. 1	16.00-16.50
St. Louis, No. 1	9.75-10.25
St. Louis, No. 2	11.50-12.00

FORGE FLASHINGS

Boston district	†7.50
Buffalo	11.00-11.50
Cleveland	11.00-11.50
Detroit	9.50-10.00
Los Angeles	9.00
Pittsburgh	13.75-14.25

FORGE SCRAP

Boston district	†6.50
Chicago, heavy	15.50-16.00

LOW PHOSPHORUS

Cleveland, crops	17.50-18.00
Eastern Pa., crops	17.00-17.50
Pitts., billet, bloom, slab crops	19.00-19.50

LOW PHOS. PUNCHINGS

Buffalo	15.50-16.00
Chicago	15.50-16.00
Eastern Pa., crops	17.50-18.00
Pittsburgh	17.50-18.00
Seattle	15.00

RAILS FOR ROLLING

5 feet and over

Birmingham	†14.00-15.00
Boston	15.00-15.50
Chicago	17.50-18.00
New York	†14.00-14.50
Eastern Pa.	17.00-17.50
St. Louis	16.00-16.50

STEEL CAR AXLES

Birmingham	†15.00-16.00
Boston district	†14.50
Chicago, net	17.50-18.00
Eastern Pa.	20.50-21.00
St. Louis	16.00-16.50

LOCOMOTIVE TIRES

Chicago (cut)	15.50-16.00
St. Louis, No. 1	12.25-12.75

SHAFTING

Boston district	†15.25-15.50
New York	†15.50-16.00
Eastern Pa.	20.50-21.00
St. Louis, 1¼-3¾"	15.50-16.00

CAR WHEELS

Birmingham	†13.50-14.00
Boston dist., iron	†10.00
Buffalo, steel	16.00-16.50
Chicago, iron	13.50-14.00
Chicago, rolled steel	14.50-15.00
Cincin., iron, deal.	12.50-13.00
Eastern Pa., iron	15.50-16.00
Eastern Pa., steel	18.00
Pittsburgh, iron	14.50-15.00
Pittsburgh, steel	18.00-18.50
St. Louis, iron	14.00-14.50
St. Louis, iron	14.00-14.50

NO. 1 CAST SCRAP

Birmingham	†13.00-13.50
Boston, No. 1 mach.	†11.00-11.50
N. Eng. del. No. 2	12.00-12.50
N. Eng. del. textile	12.50-13.00
Buffalo, cupola	13.00-13.50
Buffalo, mach.	14.00-14.50
Chicago, agri. net	9.50-10.00
Chicago, auto net	12.50-13.00
Chicago, railroad net	11.00-11.50
Chicago, mach. net	12.00-12.50
Cincin., mach. deal.	12.00-12.50
Cleveland, mach.	17.00-17.50
Detroit, cupola, net	12.50-13.00
Eastern Pa., cupola	16.00-16.50
E. Pa., mixed yard	13.50-14.00
Los Angeles, net	13.50-14.00
Pittsburgh, cupola	15.00-15.50
San Francisco, del.	13.50-14.00
Seattle	12.00-14.50
St. Louis, cupola	12.00-12.50
St. Louis, agri. mach.	14.00-14.50
St. L., No. 1 mach.	14.50-15.00
Toronto, No. 1, mach., net	12.00-12.50

HEAVY CAST

Boston dist. break.	†9.50
New England, del.	12.50-13.00
Buffalo, break.	11.00-11.50
Cleveland, break, net	13.00-13.50
Detroit, auto net	12.50-13.00
Detroit, break	9.50-10.00
Eastern Pa.	14.75
Los Ang., auto, net	13.50
New York, break	†10.50-11.00
Pittsburgh, break	12.50-13.00

STOVE PLATE

Birmingham	†7.50- 8.00
Boston district	†8.00- 8.25
Buffalo	11.50-12.00
Chicago, net	7.75-8.25
Cincinnati, dealers	6.25- 6.75
Detroit, net	7.00- 7.50
Eastern Pa.	12.50-13.00
New York, fdy.	†10.00-10.50
St. Louis	7.50- 8.00
Toronto dealers, net	6.50- 7.00

MALLEABLE

Birmingham, R. R.	†10.50-11.00
New England, del.	11.50-12.50
Buffalo	13.50-14.00
Chicago, R. R.	15.00-15.50
Cincin., agri., deal.	10.75-11.25
Cleveland, rail	15.50-16.00
Eastern Pa., R. R.	15.00-16.50
Los Angeles	17.50-18.00
Pittsburgh, rail	15.00-15.50
St. Louis, R. R.	12.25-12.75

Iron Ore

Lake Superior Ore

Gross ton, 51½%

Lower Lake Ports

Old range bessemer	$5.25
Mesabi nonbessemer	4.95
High phosphorus	4.85
Mesabi bessemer	5.10
Old range nonbessemer	5.10

Eastern Local Ore

Cents, unit, del. E. Pa.

Foundry and basic 56.63% con.	9.00-9.25
Cop.-free low phos. 58-60%	nominal

Foreign Ore

Cents per unit, c.i.f. Atlantic

Foreign manganiferous ore, 45.55% iron, 6-10% man. nom.	12.00
No. Afr. low phos.	12.00
Swedish low phos.	12.00
Spanish No. Africa basic, 50 to 60% nom.	10.00-10.50
Tungsten, short ton unit, duty pd. nom.	$17.50-18.00
N. F., fdy., 55%	7.00
Chrome ore, 48% gross ton, c.i.f.	$23.00-24.00
Molybdenum ores sulphide, per lb. molybdenum contained, f.o.b. mill	0.75

Manganese Ore

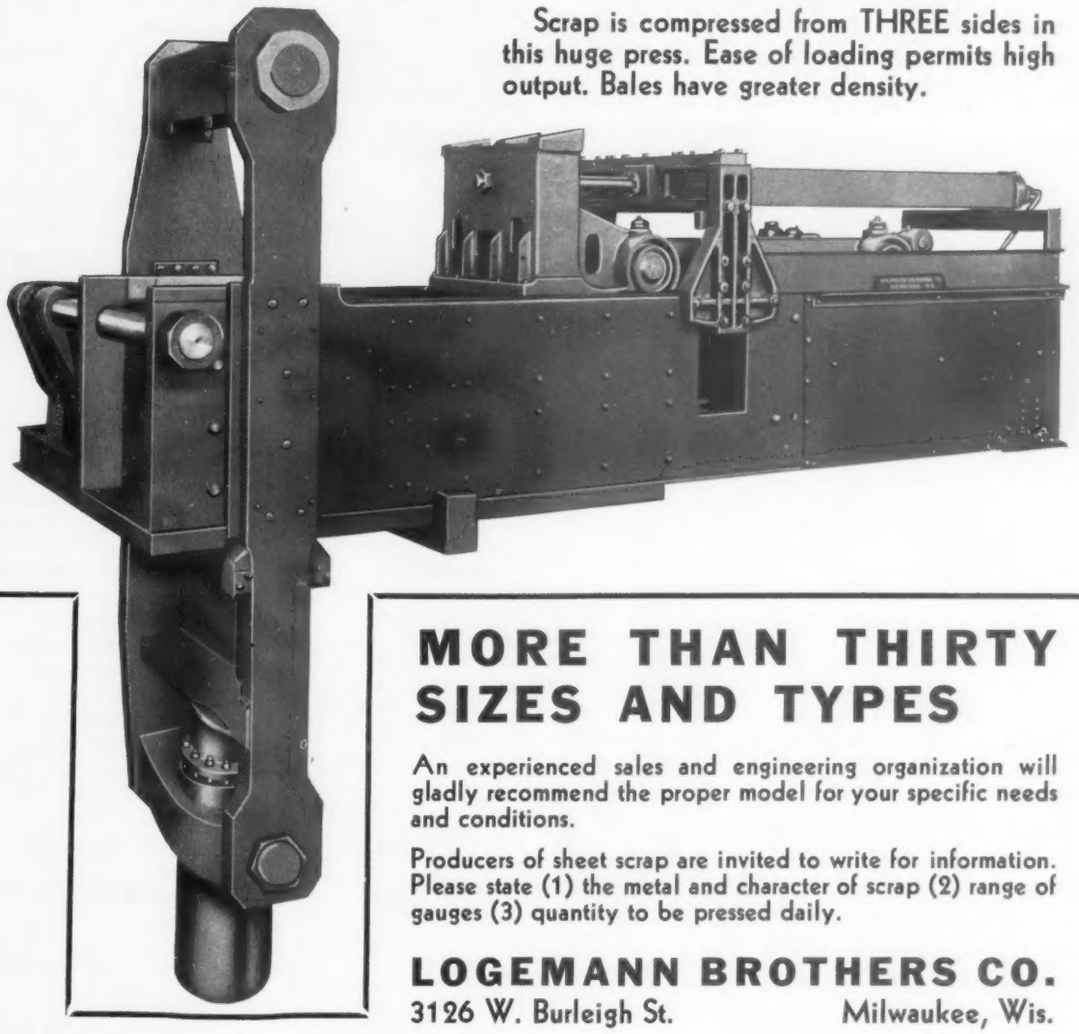
Prices not including duty, cents per unit cargo lots.

Caucasian, 50-52% nom.	29.00
So. African, 50-52% nom.	29.00
Indian, 49-50%	27.00-28.00

LOGEMANN

SCRAP PRESSES

POWERFUL RUGGED RELIABLE



Scrap is compressed from THREE sides in this huge press. Ease of loading permits high output. Bales have greater density.

MORE THAN THIRTY SIZES AND TYPES

An experienced sales and engineering organization will gladly recommend the proper model for your specific needs and conditions.

Producers of sheet scrap are invited to write for information. Please state (1) the metal and character of scrap (2) range of gauges (3) quantity to be pressed daily.

LOGEMANN BROTHERS CO.
3126 W. Burleigh St. Milwaukee, Wis.

Baling Presses . . . Pumps . . . Straighteners . . . Accumulators . . . Valves

Sheets, Strip

Sheet & Strip Prices, Pages 76, 77

Pittsburgh—Sheet mill operations are higher at 55 to 60 per cent, with strip production near 35 per cent. Demand has increased this month despite absence of heavy automotive releases, and a further increase in shipments is seen for July. A fair number of small orders are being booked, and warehouses have been more active buyers of galvanized lately. The latter is coincident with attempts to eliminate price cutting. Galvanized sheet output interrupted its previous letdown with a 1-point gain to 51 per cent.

Cleveland—Sheet and strip deliveries are fairly heavy, considering that relatively little tonnage is moving to the automotive industry. Shipments to partsmakers for new models are increasing but for the present will be more than offset by declining production of current models. Prices are steadier than in many months but are given little test. The move to stabilize galvanized sheets at 3.50c, base, carries with it the abandonment of functional allowances to distributors, a change originally instituted several months ago but more than compensated for by subsequent cutting of base prices.

Chicago—New business is mostly fill-in from miscellaneous users. Prices are firmer, and there are expectations current quotations will remain steady through this quarter regardless of demand. A firm market is reported on several large orders for galvanized sheets booked recently.

Boston—Cold strip production is expected to decline this week, although additional third quarter business is being booked. Prices have firmed, despite some shading lately. Some consumers are anticipating heavier requirements during August.

New York—Little new business is appearing, but specifications are substantial. Sellers are striving to clear old orders as soon as possible. While there is some irregularity in galvanized, prices are gradually being stabilized, with indications July will bring about a firmer price structure. Cold strip specifications are light and price concessions crop out from time to time. Here again, mills are attempting to firm up the market on new business this month.

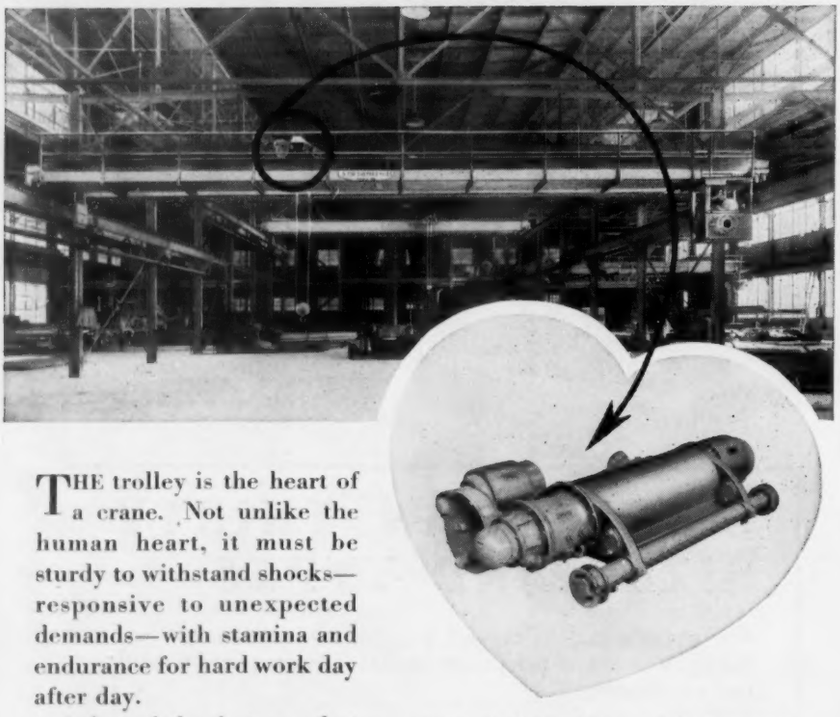
Philadelphia—A maker of Oldsmobile and Pontiac frames has started production of 1940 model work and is issuing preliminary releases. A local auto body interest is setting up dies and will start new model operations shortly. Stainless steel business includes a large strip order for two seven-car trains to be built by a local interest. Sheet prices are firm on new business, but third quarter coverage is practically complete.

Buffalo—Sheet and strip production is steady, with miscellaneous demand sustained in the face of retarding seasonal influences. Automotive orders are starting to come through in small lots, and larger releases are in prospect later. Prices are fairly steady, though reports of concessions on galvanized have not disappeared.

Cincinnati—Demand is providing shipments of about 60 per cent of producing capacity. Galvanized sheets have been more actively lately, the improvement resulting partly from a stiffening in prices. Automotive demand remains light.

St. Louis—Demand is heavier, including gains by the stove industry and warehouses. Galvanized roofing sheets are moving to rural areas at the best rate so far this year. Purchasing by refrigeration interests is fair, while automotive strip releases are somewhat better. Production is steady.

OVERHEAD
Electric Traveling Cranes
CAPACITIES 1 TO 450 TONS



THE trolley is the heart of a crane. Not unlike the human heart, it must be sturdy to withstand shocks—responsive to unexpected demands—with stamina and endurance for hard work day after day.

A few of the features that contribute to the long life and trustworthy service of Shepard Niles crane trolleys are—load carrying frame of steel—balanced drive gearing—automatic oil bath lubrication and complete enclosures for all vital parts.

A detailed description of the heart of a Shepard Niles crane is given in Bulletin No. 123. A copy is yours for the asking.

A COMPLETE LINE OF CRANES & HOISTS

SHEPARD NILES CRANE & HOIST CORP.

358 SCHUYLER AVENUE . . . MONTOUR FALLS, N. Y.

Plates

Plate Prices, Page 76

New York—Steps to eliminate abuses in fabrication-in-transit rates has been taken by several plate producers, one quoting on a delivered basis to the fabricator's shop and billing separately allowance for stopover for fabrication. It has been largely in fabricated-in-transit work that plate prices have been weak.

Meanwhile, buying is light, with concessions of around $2 a ton frequent. Most mills, starting this month, will take a firmer stand for the full base price, 2.10c. Three cargo boats, closing Aug. 1 with the maritime commission, take 11,700 tons, mostly plates, while the navy closes July 6 on 21,300 tons of plates and strip for two battleships.

Boston—Plate buying is mostly in small lots, consumers frequently turning to warehouses for current needs. Shipyards continue the best customers, but such demand is not widely distributed. Structural, boiler, tank, pipe and railroad requirements are lagging.

Philadelphia — Shipbuilders are asking bids July 5 on 5000 tons of plates and 1000 tons of I-beams for the navy repair ship AR-5. The Chester, Pa. builder has released some tonnage for maritime vessels, and additional releases are expected shortly. A strong move is reported under way to reopen the old Cramp shipyard here which has been idle for years. Pennsylvania railroad has placed about 500 tons of wide plates for locomotive tenders. Backlog of the local locomotive builder is light since its order for 28 engines for the Southern Pacific is about completed. Large plate shipments have been made the last few weeks to Italy, Sweden, Norway, Greece and Finland, but the export market now is quieter.

San Francisco — Pacific Gas & Electric Co., San Francisco, has placed 400 tons of plates for a penstock for erection near Sonora, Calif., and 200 tons of welded steel pipe. It also has taken bids on 150 tons for a smoke stack. Bids have just been opened on 100 tons for welded steel pipe for the east bay municipal utility district, Oakland, Calif. Awards totaled 650 tons and brought the aggregate to date to 18,059 tons, compared with 15,257 tons for the same period a year ago.

Plate Contracts Placed

600 tons, penstock and pipe for Pacific Gas & Electric Co., near Sonora, Calif., to Western Pipe & Steel Co., San Francisco.

Plate Contracts Pending

5000 tons, navy repair ship AR-5; bids July 5. Also includes 1000 tons I-beams.

500 tons, 24-inch water system extension, Seattle; Argentieri & Colarossi, Seattle, low; may go all cast iron.

150 tons, smokestack for Pacific Gas & Electric Co., San Francisco; bids in.

105 tons, outlets pipes, Wickiup dam, Oreg.; bids in at Denver.

Unstated, 96-inch outlet pipes for Wickiup dam, Oreg.; bids to Denver, July 6.

Unstated, untanking equipment for Bonneville authority for North Vancouver, Wash., substation; D. J. Malarkey, Portland, Oreg., low.

Bars

Bar Prices, Page 76

Cleveland—Bar sales are maintained, June business showing a small gain over May. Demand is mixed. Some automotive business for new models is appearing from

CASTING PROBLEMS *Solved* BY THE TRANTINYL PROCESS

Our advanced metallurgical and precision methods make possible . . .

- the elimination of machine work
- the reduction of operating costs and the improvement in quality of seamless casing and tubing
- the creation of new steels for specific operations.

1 OUNCE TO 1,000 POUNDS

Write Jack Trantin, our Metallurgical Engineer . . . without obligation.

YOUNGSTOWN ALLOY CASTING CORPORATION

Youngstown TRANTINYL QUALITY DISTINCTION *Ohio, U.S.A.*

BACKED BY 23 YEARS FOUNDRY METALLURGICAL EXPERIENCE

Behind the Scenes with STEEL

High Cost of Speeding

■ "Speed is expensive. Slow down and save," says Travelers Insurance Co. in a most effective message on safe driving. On the basis of gasoline and oil consumption, tire wear, and general maintenance, it costs 65c for each hour you save in steady driving when you increase your speed from 35 to 45; $1.20 per hour saved to increase from 35 to 55; $2.08 per hour to jump from 45 to 55; and $2.44 per hour to go from 45 to 65 m.p.h. So, the next time you're in a whale of a hurry to get somewhere, stop and figure out if you can really afford the rush.

Blind Honesty

■ Who says money is scarce, asks one of our up-and-coming young editors. Explains he: Yesterday morning I stopped in the beer joint next door for a pack of cigarettes (sic) and mistakenly dropped five $1.00 bills right in front of the bar. I went back about ten minutes later acting on a hunch that someone working there might have picked them up. There were about twenty people in the place and eight or ten at the bar, just a yard away from my five bills strewn all over the floor. I submit, says he, they don't even know what it looks like anymore.

Dandies

■ Well, perhaps that's so, but Shell Oil certainly doesn't think so in that snappy advertisement of theirs on page 63. And incidentally, don't overlook LaSalle Steel's "publication within a publication" this week. *Stressproof News* will be showing up regularly now, so get acquainted.

Where's Papa?

■ One new subscriber we welcomed into the fold last week has us a bit worried. He's apparently not fooling because neatly clipped to his letter were four perfectly good dollar bills, and since everything else was in order, perhaps it was just one of those hot weather slips that caused him to write: "Please enter my subscription to the STEEL *mamagazine.*"

Making Friends

■ Salesmen calling on the Edwin L. Wiegand Co., Pittsburgh, are handed a little four page folder, "To Our Friends, The Sales Representatives," which we believe to be quite unique. They go a long way in making friends by explaining first of all that salesmen's calls are not restricted to any particular hours of the day but that the salesman can help save his own and the buyer's time by doing his business promptly. Secondly they *ask* to be kept up-to-date on new products in order to give the salesman every possible opportunity to obtain some of their orders. They point out their desire to have the salesman work through the purchasing head in meeting any of the buying personnel, introductions being made gladly. And they also *ask* for suggestions on how they can help lower the sales cost of doing business with them! There are other equally interesting comments including the principles of the National Association of Purchasing Agents, in which the company believes and which they practice. If you would like a copy of this little booklet, we feel sure they'll be glad to send one along.

Time Saver

■ Probably you, too, have from time to time used STEEL's handy Helpful Literature department which provides easy access to manufacturers' new descriptive material twice each month. Up in Hamilton, Ont., H. M. Millar of Smart-Turner Machine Co., Ltd., finds it particularly "helpful." He writes: *Many thanks for the great convenience this service offers.*

SHRDLU

partsmakers, and in certain instances shipments still are being made for current model requirements. Demand from some machinery builders has improved moderately.

Chicago—Bars are quieter, with little change indicated until the middle or latter half of July. Both automotive and farm equipment buying is light, leaving miscellaneous consumers to furnish chief support to demand.

Boston—Carbon bar demand is barely steady, but alloys are moving fairly well in small lots. Machine tool builders and shipyards are among the best consumers. Cold-finished bars generally are slow.

New York — Merchant steel bar buying is light and purchases to avoid the $1 increase July 1 were not numerous. Alloy bars are relatively more active than commercial grades. Cold-finished are slightly more active with several sellers.

Philadelphia—Tool makers, equipment builders and the screw machine trade are most prominent in cold-finished and hot-rolled alloy bar specifying. Ship work includes about 300 tons for navy repair ship AR-5 on which bids close July 5.

Buffalo—Bar production is slightly heavier, aided by better automotive orders. Reinforcing bar demand is improving gradually as work progresses on federal projects. Output is 50 to 55 per cent.

Pipe

Pipe Prices, Page 77

Pittsburgh—Pipe production has been curtailed by vacation shutdowns, with orders being filled from stock in most cases. Orders are unchanged, standard pipe moving weli and mechanical tubing and boiler tubes continuing slow. Oil country goods are in light but steady volume. Mill prices are firm, but scattered weakness is reported in secondary markets.

Cleveland—Tubular goods continue the sustained demand that has prevailed for a number of weeks. Standard pipe makes the best relative showing, drawing good support from building construction. Cast pipe producers are unable to add to backlogs, with new inquiries also generally light.

Boston — Cast pipe buying again has improved, close to 2000 tons being involved in purchases by North Kingston, R. I., and Lincoln, Haverhill and Holyoke, Mass., the former taking 1400 tons. The district foundry continues five-day operations with a substantial backlog.

Steel pipe demand is steady, but not brisk. A fair volume is entering into shipbuilding.

New York — Cast pipe buying in this district during the first half was below expectations. Pending tonnage is also light. Several inquiries for North Beach airport, New York, aggregating 600 tons, have been covered. A large part of the Circumferential highway, Brooklyn-Queens, requirements is being supplied from New York city yard stocks. Merchant steel pipe demand is maintained, but re-sale prices are less stable. Mill prices, however, appear to be holding. Building needs retain the improvement noted two months ago and are expected to reach a peak in early fall.

San Francisco—United States Pipe & Foundry Co. is low on 165 tons of 2 to 6-inch pipe for Burbank, Calif. Awards aggregated 383 tons, bringing the total to date to 16,757 tons as compared with 14,832 tons for the corresponding period in 1930.

Seattle—More activity is apparent, inquiry as a rule being for small tonnages. Largest contract pending is for Warren avenue extension, Seattle, 900 tons if all cast iron. Portland has awarded 200 tons 8-inch to U. S. Pipe & Foundry Co. Superior Construction Co., Seattle, is low for an extension at Columbia City, Oreg., involving 145 tons, alternate steel.

Cast Pipe Placed

200 tons, 8-inch for Portland, Oreg., to H. G. Purcell, Seattle, for U. S. Pipe & Foundry Co., Burlington, N. J.

100 tons, 10 to 16 inch, Holyoke, Mass., to R. D. Wood & Co., Florence, N. J.

Cast Pipe Pending

1400 tons, mostly 12-inch, North Kingston, R. I.; bids in.

900 tons, if all cast iron, Warren avenue improvement, Seattle; Argentieri & Colarossi, Seattle, low.

300 tons, 6 to 12-inch, Haverhill, Mass.

240 tons, 6-inch bell and spigot; bids in at Spokane, Wash.

235 tons, 8-inch, Lincoln, Mass.; bids in, contractor to purchase.

165 tons, 2 to 6-inch, Burbank, Calif., United States Pipe & Foundry Co., Burlington, N. J., low.

145 tons, system extension, Columbia City, Oreg.; Superior Construction Co., Seattle, low.

100 tons or more, steel for Alderwood district, Seattle; Pacific Water Works Supply Co., Seattle, low.

Unstated, 3 to 6-inch, for District 58, Seattle; bids to Parker & Hill, engineers, Seattle, July 7.

Tin Plate

Tin Plate Prices, Page 76

Tin plate operations are slightly lower at 68 per cent after holding at 70 for several weeks. The letdown is not regarded as indicative of a downward trend, some recovery being expected after the holiday. Demand is fairly steady, with sanitary can needs sustained.

Ferroalloys

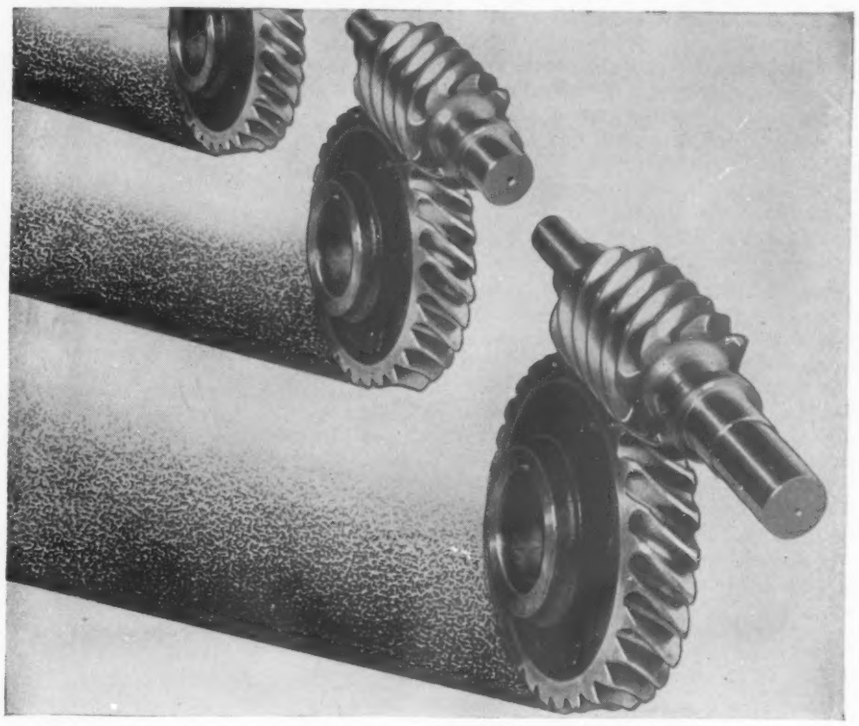
Ferroalloy Prices, Page 78

New York — While steady, shipments of ferromanganese and other ferroalloys, have not improved materially, but are generally holding. Prices for third quarter are reaffirmed and consumers are releasing shipments in numerous instances about in line with consumption.

Wire

Wire Prices, Page 77

Pittsburgh—June wire tonnage was somewhat better than May, largely because of manufacturers' wire demand. Merchant products are in a summer slump. Automotive purchasing is aiding the manu-



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facturers' division, although most tonnage is for a wide range of manufacturing consumers. Prices are steady, merchant quotations holding in the face of light buying.

Cleveland—Although restricted by quiet in automotive demand, business in wire and wire products is fairly well sustained. Stiffening in prices of merchant products last month tended to stimulate some buying. June production varied only slightly from May.

Chicago—Business is well sustained, June tonnage comparing favorably with that of May. Demand is principally in small lots from a large number of miscellaneous consumers, one exception being road building, which is taking large lots of reinforcing mesh. Merchant products are moving more slowly in rural areas but nail demand is sustained. Automotive requirements, currently light, are expected to continue restricted until the middle of August. Despite some irregularities, prices generally are steady.

Boston—Wire orders have slackened and finishing operations are not much above 50 per cent. Both automotive and textile consumers are light buyers. Some flat wire specialties are going at concessions and electrical building wire prices continue easy.

New York—Wire buying is heavier though spotty. Manufacturers' wire business in some cases last month was ahead of May, but demand for specialties was little changed. Furniture trade is buying spring wire in good volume. Prices on merchant products, notably nails, have strengthened the past several weeks.

Rails, Cars

Track Material Prices, Page 77

Placing of 1110 freight cars by the Western Maryland is the high spot in the railroad market. They were awarded to several builders. Five locomotives placed by three railroads shows need for motive power. Rail purchases are small, including 7700 tons by the Chicago, Burlington & Quincy and 3200 by the Kansas, Oklahoma & Gulf. Florida & East Coast has ordered two light-weight seven-car trains for fast service.

A few cars and locomotives are on inquiry but no large lots are in prospect. Chicago & North Western, expected to inquire for 800 cars, has not done so.

Car Orders Placed

Florida East Coast, two seven-car stainless steel streamlined trains, to Edward G. Budd Mfg. Co., Philadelphia; powered by diesel-electric locomotives.

Western Maryland, 1100 freight cars, as follows: 500 hoppers to Pressed Steel Car Co., Pittsburgh; 500 hoppers to Bethlehem Steel Co., Bethlehem, Pa.; 100 gondolas and 10 flatcars to Greenville Steel Car Co., Greenville, Pa.

Locomotives Placed

Chicago, Rock Island & Pacific, streamlined diesel-electric locomotive to American Locomotive Co., New York.

Green Bay & Western, three 2-8-2 type to American Locomotive Co., New York.

Wabash, 300-horsepower diesel switcher for use at St. Thomas, Ont., to General Electric Co.; court permission granted.

Rail Orders Placed

Chicago, Burlington & Quincy, 7700 tons; 4000 tons to Carnegie-Illinois Steel Corp. Chicago, 2700 tons to Colorado Fuel & Iron Co., Denver, 1000 tons to Inland Steel Co., Chicago.

Kansas, Oklahoma & Gulf, 3200 tons, to Carnegie-Illinois Steel Corp., Chicago.

Car Orders Pending

Dow Chemical Co., 10 tank cars of 50 tons and 8000-gallons capacity.

Erie Railroad, six auxiliary water tank cars, 70 tons and 16,000-gallon capacity.

Locomotives Pending

Kansas City Southern, one 1000-horsepower diesel-electric switching locomotive.

Shapes

Structural Shape Prices, Page 76

New York—Orders for fabricated structurals booked in May were the largest for any month this year, according to reports received by the American Institute of Steel Construction, amounting to 156,207 tons. In the first five months this year bookings totaled 553,252 tons, compared with 390,201 in the comparable 1938 period. Shipments for the five months aggregated 532,633 and the backlog of orders amounts to 502,119 tons, thus indicating a consistent improvement in volume for this year.

Cleveland — Small structural orders are fairly numerous and compensate for absence of large awards. Competition is sharp, resulting in depressed prices. Carnegie-Illinois Steel Corp. recently booked approximately 13,500 tons of sheet piling,

Shape Awards Compared

	Tons
Week ended July 1	14,850
Week ended June 24	17,494
Week ended June 17	15,598
This week, 1938	25,128
Weekly average, year, 1938	21,568
Weekly average, 1939	22,407
Weekly average, May	23,691
Total to date, 1938	430,695
Total to date, 1939	582,579

Includes awards of 100 tons or more.

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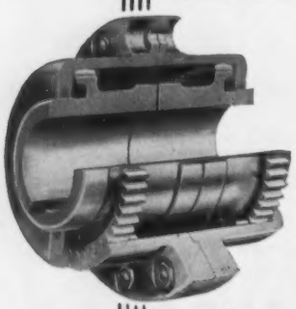

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for the Cuyahoga river straightening project, Cut. No. 6; through Great Lakes Dredge & Dock Co., Cleveland. Bids are due July 13 on 1500 tons for the Columbus road bridge.

Pittsburgh—Inquiries continue to come out in excellent volume, with more public projects reaching the bidding stage. A fair amount of private work also awaits placement, and much of this is bargaining for prices.

Chicago — Structural steel continues to meet good demand with a number of substantial new inquiries noted. Over 3800 tons is involved in eight actively pending projects, including 750 tons for Austin-Western Co. factory building, Aurora, Ill.; 800 tons for an armory here, and 510 tons for seven highway bridges for Indiana.

Boston — Awards of 100 tons or more are few. New inquiry is down slightly with less bridge work active. Awards include 300 tons for bridges, Maine, Vermont and Connecticut, all small. While fabricated prices continue weak, plain material, which recently was subjected to scattered shading, is steadier.

Philadelphia—Steel requirements from building trades display a mild turn for the better, with several industrial expansions stimulating the market. Determined effort is said to be underway to improve the price situation, with prices on fabricated material remaining well under published levels.

Buffalo—Activity continues to expand to new high levels for the year. Aggregate pending tonnage totals nearly 10,000 tons. Pending work includes 550-ton Brockport State Normal school, 450-ton public school No. 18 here, and the 300-ton Fredonia State Normal project.

St. Louis — Market is quiet, with no jobs of consequence placed and few pending. Backlogs enable fabricating yards to maintain 30 per cent operation.

San Francisco—Activity is disappointing with awards aggregating less than 700 tons, bringing the total for the year to 67,804 tons compared with 65,112 tons in 1938.

Seattle — Important awards are lacking, but fabricating shops have fair backlogs. Award of 608 tons, shapes and machinery for a state span, Snohomish county, Washington, is still pending.

Shape Contracts Placed

3300 tons, William Howard Taft high school, Bronx, New York, to Bethlehem Fabricators, Bethlehem, Pa.

1600 tons, transmission towers, Lawrenceburg, Tenn., for Tennessee valley authority, to Blaw-Knox Co., Blawnox, Pa.

1350 tons, sheet piling, cut No. 6, Cuyahoga river straightening project, to Carnegie-Illinois Steel Corp., Pittsburgh; through Great Lakes Dredge & Dock Co., Cleveland.

925 tons, Silliman college building, Yale University, New Haven, to Ingalls Iron Works, Birmingham, Ala.; through Vermilya Brown Co., New York.

850 tons, public school 31, New York, to Lehigh Structural Steel Co., Allentown, Pa.

500 tons, factory building, for American Smelting & Refining Co., San Francisco, to Moore Dry Dock Co., San Francisco.

420 tons, state bridge, Milford, O., to Fort Pitt Bridge Works, Massillon, O.; through Contractors Finance Corp.

400 tons, building, Lever Bros., Baltimore, to Belmont Iron Works, Philadelphia; through Stone & Webster, Boston.

350 tons, civic auditorium, Great Falls, Mont., to Minneapolis-Moline Power Implement Co., Minneapolis.

330 tons, Y. M. C. A. building, Wilmington, Del., to Bethlehem Steel Co., Bethlehem, Pa.

300 tons, building, Owens-Illinois Glass Co., Millville, N. J., to Belmont Iron Works, Philadelphia; through Hughes, Foulkrod Co., Philadelphia.

265 tons, state bridge AD-52-178, Adams county, Ohio, to Bethlehem Steel Co., Bethlehem, Pa.

265 tons, Delaware aqueduct section, items 44 and 46, Putnam county, New York, to Jones & Laughlin Steel Corp., Pittsburgh.

255 tons, bridge, Madison county, Illinois, to American Bridge Co., Chicago.

250 tons, state bridges FAP-149-B, Aurora, Colo., to Kansas City Structural Steel Co., Kansas City, Kans.

250 tons, bridge, Whiteside county, Illinois, to American Bridge Co., Chicago.

240 tons, addition, hinge shop, Moore Drop Forging Co., Springfield, Mass., to Haarmann Steel Co., Holyoke, Mass.

235 tons, state bridge, Windsor, Vt., to American Bridge Co., Pittsburgh.

220 tons, bridges, section 18, Franklin county, for Pennsylvania turnpike commission, to Bethlehem Steel Co., Bethlehem, Pa.

215 tons, bridge 14A, Milwaukee county, Wisconsin, to C. Hennecke Co., Milwaukee.

210 tons, state bridge, Crestline, O., to Burger Iron Works, Akron; through G. B. Herring & Son, Mansfield.

210 tons, Lincoln school addition, Chicago, to Fort Pitt Bridge Works, Pittsburgh.

205 tons, heater exchange structure, Paulsboro, N. J., to Bethlehem Fabricators Inc., Bethlehem, Pa.

200 tons, viaduct, River avenue, Pittsburgh, to Fort Pitt Bridge Works, Pittsburgh.

195 tons, mine shop, University of Utah, Salt Lake City, Utah, to International Steel Co., Evansville, Ind.

175 tons, engineering building, Bucknell university, Lewisburg, Pa., to Lehigh Structural Steel Co., Allentown, Pa.

175 tons, two-span steel truss bridge, North Pownal, Vt., and I-beam 74-foot span Goshen-Brandon, Vt., to American Bridge Co., Pittsburgh; through A. J. Maxymillian Inc., North Adams, Mass., and Bristol Construction Co., Bristol, N. H., general contractors, respectively.

175 tons, Mechanicsville bridge, Thompson, Conn., for state, to American Bridge Co., Pittsburgh.

160 tons, bridge, Carter-Johnson counties, Tennessee, to Bristol Steel & Iron Works Inc., Bristol, Va.

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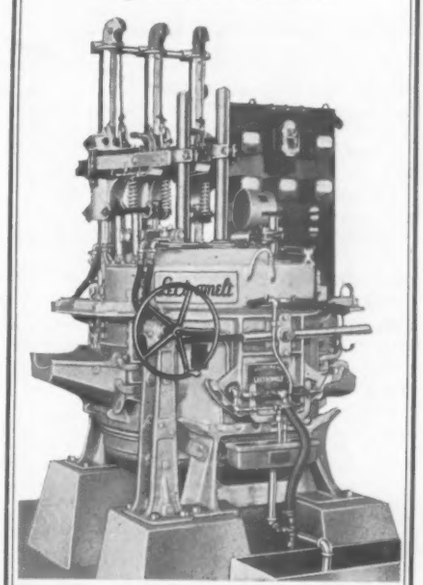

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140 tons, office and warehouse building, U. S. government, St. Louis, to Truscon Steel Co., Youngstown, O. Erroneously reported last week as awarded to Stupp Bros. Bridge & Iron Co., St. Louis.

130 tons, state highway bridge, Noxen, Pa., to American Bridge Co., Pittsburgh.

130 tons, store, W. T. Grant Co., Davenport, Ia., to Davenport Machine & Foundry Co., Davenport.

130 tons, natural resources building, Urbana, Ill., for state, to Duffin Iron Co., Chicago.

120 tons, repairs, Lake street bridge, Elmira, N. Y., to American Bridge Co., Bronx, N. Y.

115 tons, pier casings for Ogeechee river bridge, Ways, Ga., for Seaboard Air Line, to Richmond Structural Steel Co., Richmond, Va.

110 tons, building, Montgomery Ward & Co., New London, Conn., to Topper & Griggs, Hartford; Bethlehem Fabricators Inc., to fabricate, Torrington Building Co., Torrington, Conn., general contractor.

100 tons, state office auditorium, Frankfort, Ky., to International Steel Co., Evansville, Ind.

Shape Contracts Pending

2100 tons, Cedar street bridge, Youngstown, O.; bids July 6.

2000 tons, connecting link between north ramp and Lake Shore drive, Main street bridge, Cleveland; bids out soon.

1900 tons, Chicago subway contract S-3; bids extended from June 29 to July 6.

1500 tons, Columbus road bridge, over Cuyahoga river, Cleveland; bids July 13.

1500 tons, two bridges, Scotia, Calif.; bids soon.

1350 tons, curbing, New York, for city.

1300 tons, superstructure, Sixth street viaduct, Cincinnati, O.

1000 tons, Metro Stores, T street, Sacramento; bids soon.

1000 tons, mill building, Consolidated Copper Co., Kimberly, Nev.; bids opened.

900 tons, viaduct, New Castle county, Delaware; bids July 19.

900 tons, office building, for Aetna Life Insurance Co., New York.

800 tons, plant, Goodrich Tire & Rubber Co., Clarksville, Tenn.; bids July 8.

800 tons, Illinois armory board, armory, northwest side, Chicago; bids in.

750 tons, Austin-Western Co., factory building, Aurora, Ill.; bids in.

700 tons, theatre building, for New York Life Insurance Co., New York.

700 tons, addition to public school No. 67, Brooklyn, N. Y.

650 tons, crane girders, for Republic Steel Corp., Warren, O.

600 tons, bridge over Tennessee river, Watts Bar dam, for Tennessee Valley authority.

510 tons, seven highway bridges, state of Indiana; bids in.

500 tons, overpass, San Antonio, Tex.; bids in.

450 tons, tainter gates and bridges, lower Colorado river authority, Austin, Tex.; bids in.

446 tons, including 246 tons of sheet piling, hangar and barracks, Coast Guard air station, San Francisco; Wm. Wills, P. O. Box 80, Presidio, Calif., low at $513,000.

432 tons, Howell school, Cleveland; De Hamel Construction Co., Cleveland, low.

400 tons, Commonwealth Edison Co., synchronous condenser house, Crawford avenue, Chicago; bids July 5.

400 tons, state bridges, Esperence, N. Y.

330 tons, building, Federated Metals Co., San Francisco; pending.

300 tons, three turntables for Southern Pacific Co., San Francisco; bids in.

296 tons, tunnel supports, specification 861, relocation Southern Pacific tracks, Kennett division, Central Valley project, Calif.; bids July 14.

275 tons, building, Rome, N. Y., for Oneida county, New York.

250 tons, state bridge, Franklin county, Ohio; bids July 7.

250 tons, repairs to suspension bridge, Portsmouth, O.

245 tons, state bridge, Lewis county, Washington, bids to Olympia, July 11.

225 tons, channel improvements, Hornell, N. Y., for army engineers.

225 tons, Wisconsin dial center, for C. & P. Telephone Co., Chevy Chase, Md.

225 tons, bridge over Oil creek, Titusville, Pa., for Crawford county, Pennsylvania.

225 tons, addition to factory, for Scholler Bros. Inc., Philadelphia.

225 tons, state bridges RC-4033 and RC-4034, Goshen, N. Y.

200 tons, 45 lattice struts, Sixty-third street trestle, Chicago Rapid Transit Co.

200 tons, bridge SS-39.6, Brooklyn, N. Y.

200 tons, Shore Parkway bridge MS-39-14-A, New York, for city.

200 tons, bridge, contract 1820, Valparaiso, Ind.

185 tons, bridge, Division street, Youngstown, O., for Mahoning county, Ohio.

165 tons, switch house, for Commonwealth Edison Co., Chicago.

165 tons, alterations to Buhl hospital, Sharon, Pa.

165 tons, bridge, Kenyons, R. I., for New York, New Haven & Hartford railroad.

160 tons, grade crossing elimination, Staten Island, N. Y.

150 tons, Outer Mission high school, San Francisco; Anderson & Ringrose, San Francisco, low.

150 tons, suspension bridges, McCall, Idaho.

150 tons, building, for Wheeling Corrugating Co., Long Island City, N. Y.

133 tons, two-span steel truss bridge, 234 feet, Pownal, Vt.; A. J. Maxymillian Inc., North Adams, Mass., low.

120 tons, warehouse, Earle M. Jorgensen Co., Oakland, Calif.; bids opened.

110 tons, factory building, for Blake & Johnson Co., Waterville, Conn.

110 tons, bridge over Salmon river, Malone, N. Y.

110 tons, bridge, contract 1823, Martinsville, Ind.

100 tons, Alexander county, Illinois, Mississippi river improvements, for United States engineers.

Unstated, trash racks, hoists, gates and miscellaneous, for Leavenworth, Wash., fish hatchery and control works; bids to Denver July 5 and 7; Specs. 1249-D and 1251-D.

Unstated, radio building and towers, Bellingham, Wash., for C. A. A.; C. E. Peters, Salt Lake City, low.

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Reinforcing

Reinforcing Bar Prices, Page 77

New York—For New York state highways, bids are in on more than 1500 tons, mostly mesh. Actual buying, however, is less active and prices, while showing some improvement, are subject to change. Bridge requirements are heavier, notably in New Jersey, that state also taking bids on more highway-mesh work.

Pittsburgh — There is still considerable evidence of weakness in concrete bars. A large number of pending jobs have been taken off

the market recently in this area at the lower prices. Awards in other districts are not coming out so fast, and in some instances tonnage is piling up. Volume of new business is large enough to indicate heavy orders will be booked until late this fall.

Cleveland — Awards are led by 1050 tons for the Luna park housing project here, to Patterson-Leitch Co., Cleveland; through Hunkin-Conkey Construction Co., Cleveland. Bids go in July 13 on 1300 tons for the Columbus road bridge, Cleveland. Fabricators are fairly busy on a number of school projects here. Prices fail to stiffen.

Chicago—Bidding on Chicago subway contract S-3, involving approximately 3700 tons of concrete bars, has been postponed to July 6. Inquiries are out on 1000 tons for the Ida B. Wells low-cost housing project in the colored section, south side Chicago. Total tonnage is believed to be on the increase, with steady call expected to be felt throughout the summer. Prices remain only fair.

Boston — Reinforcing steel contracts and inquiry are heavier, with close to 1000 tons purchased while new work, notably dams in various sections of New England, involves 3000 tons. A housing project, Charlestown district, Boston, involves 1500 tons. The bulk of tonnage required in the Connecticut river flood control work covering recent lettings has been placed. Prices remain weak.

Philadelphia—Volume of pending work has increased moderately, but prices remain unsatisfactory. Public projects continues to dominate recent awards.

Buffalo — Additional interest was recently injected into the market with the expectations that several substantial awards will be made soon. Topping the list is the new $2,000,000 factory-warehouse to be built by General Mills Inc., here, calling for 1325 tons.

San Francisco — The reinforcing bar market was the most active one of the week with 4743 tons placed. This brought the year's aggregate to 85,737 tons, compared with 55,999 tons last year.

Reinforcing Steel Awards

1300 tons, plant addition, Washburn Crosby division, General Mills Inc., Buffalo, to Bethlehem Steel Co., Bethlehem, Pa.; Charles H. Wing Co., contractor.

1200 tons, Connecticut river flood control, Holyoke, Mass., to Bethlehem Steel Co., Bethlehem, Pa.; Daniel O'Connell & Son, contractors.

1050 tons, Luna park housing project, Cleveland, to Patterson-Leitch Co., Cleveland; through Hunkin Conkey Construction Co., Cleveland.

967 tons, bureau of reclamaion, invitation 33,208-A-1, Pollock, Calif., to Columbia Steel Co., San Francisco.

850 tons, Conemaugh river flood control, Johnstown, Pa., to Bethlehem Steel Co., Bethlehem, Pa.; Al Johnson Construction Co., contractor.

693 tons, Western Regional laboratory, Albany, Calif., to Truscon Steel Co., San Francisco.

480 tons, section 18, Pennsylvania turnpike, Franklin county, Pennsylvania, to

Concrete Bars Compared

	Tons
Week ended July 1	10,819
Week ended June 24	15,003
Week ended June 17	8,837
This week, 1938	13,037
Weekly average, year, 1938	6,959
Weekly average, 1939	10,473
Weekly average, May	9,743
Total to date, 1938	148,403
Total to date, 1939	272,297

Includes awards of 100 tons or more.

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Bethlehem Steel Co., Bethlehem, Pa.; C. J. Langfelter, Rosedale, Md., contractor.

400 tons, river intake, contract 12, Owensboro, Ky., to Truscon Steel Co., Youngstown, O.; Foundation Co., New York, contractor.

400 tons, extension to steam distribution system, Washington, to Truscon Steel Co., Youngstown, O.; T. M. Flanaghan, Reading, Pa., contractor.

380 tons, federal building, Anchorage, Alaska, to unstated eastern interest; McCarthy Bros., St. Louis, general contractors.

367 tons, four bridges, Los Angeles county, California, for state, to unnamed interest.

250 tons, viaduct, Thirty-third and Western avenue, Chicago, to Calumet Steel Co., Chicago.

250 tons, Cross island parkway, Queens and Nassau counties, New York, to Jones & Laughlin Steel Corp., Pittsburgh; Tully & DiNapoli, contractors.

220 tons, Connecticut river flood control, East Hartford, Conn., to Truscon Steel Co., Youngstown, O.; M. A. Gammino & Son, contractors.

210 tons, flood dike, contract C, Springfield, Mass., to Bethlehem Steel Co., Bethlehem, Pa.; Lane Construction Co., contractor.

207 tons, sections 16A and 17, Pennsylvania turnpike, Fulton and Huntingdon counties, Pennsylvania, to Bethlehem Steel Co., Bethlehem, Pa.; L. M. Hutchinson, Mt. Union, Pa., contractor.

205 tons, highway project, Epping, N. H., to Bancroft & Martin Rolling Mills Co., Portland, Me.; Lane Construction Co., Meriden, Conn., general contractor.

200 tons, men's union building, University of Minnesota, Minneapolis, to Bethlehem Steel Co., Bethlehem, Pa.

190 tons, soy bean elevator, Decatur, Ill., to Truscon Steel Co., Chicago.

158 tons, Wailuku high school, Maui. T. H., to Columbia Steel Co., San Francisco.

157 tons, bridge, Waimea, Kauai, T. H., to unnamed interest.

140 tons, bridge, Winfield, Kans., to Sheffield Steel Corp., Kansas City, Mo.

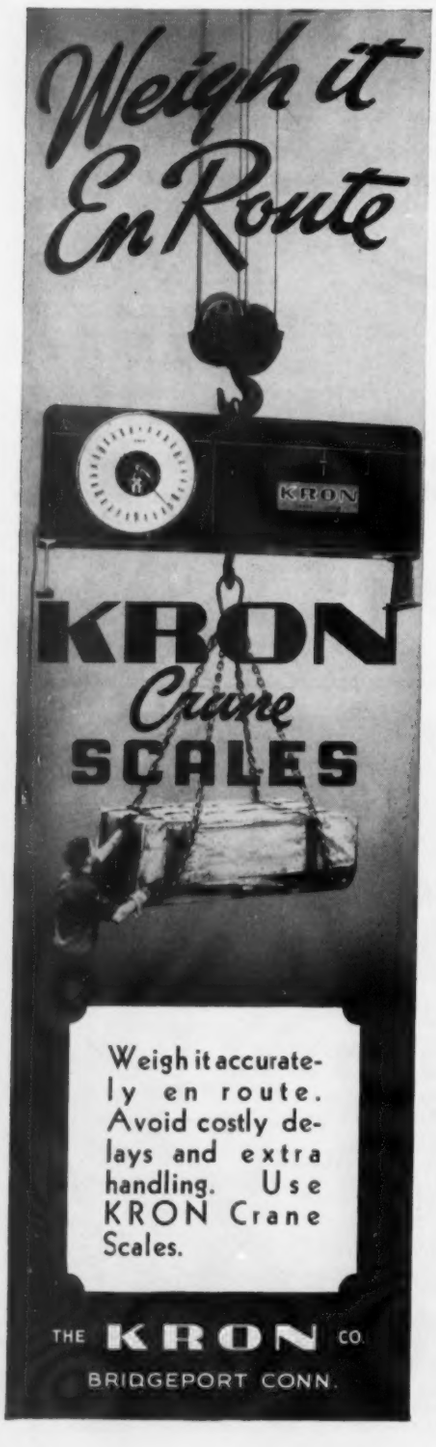
130 tons, Coca Cola plant, Seattle, to Seattle Steel Co.

110 tons, North Metropolitan relief sewer, Everett-Chelsea, Mass., to Bethlehem Steel Co., Bethlehem, Pa.; Silas Mason Co., contractor.

105 tons, bridge, Thomson, Conn. ,to Truscon Steel Co., Youngstown, O.; Arute Bros. Inc., New Britain, Conn., general contractors.

100 tons, lock No. 4, Clarksville, Mo., to Laclede Steel Co., St. Louis.

100 tons, Fairview hospital, Cleveland, to Patterson - Leitch Co., Cleveland; through Albert M. Higley Co., Cleveland.



Reinforcing Steel Pending

1955 tons, housing project, Memphis, Tenn.; S. & W. Construction Co., Memphis, general contractors.

1399 tons, relocation Southern Pacific tracks, Central Valley project, Calif., specification 861, placing only; bids July 14.

1300 tons, Columbus road bridge over Cuyahoga river, Cleveland; bids July 13.

1015 tons, dam, Franklin, N. H.

1000 tons, Panama Canal schedule 3492; bids in.

1000 tons, Charlestown housing project, Boston; bids July 17.

650 tons, buildings, San Jose Cement Co., San Jose, Calif.; pending.

600 tons, sewage disposal plant, Waterloo, Iowa, Dobson-Robinson Co., Lincoln, Nebr., general contractor.

500 tons, several Washington state highway projects; general contracts awarded.

500 tons, 55 houses and community buildings, Honolulu, T. H.; bids soon.

405 tons, power plant, drop No. 3, Imperial Irrigation District, El Centro, Calif.; bids July 18.

400 tons, wasteway, Roza project, Washington state; bids to reclamation bureau, Yakima, Wash., July 15; Spec. 855.

400 tons, grain storage, Central Soyal Co., Decatur, Ill.

316 tons, paint shop and transformer building, specification 8994, Mare Island navy yard, Calif.; bids rejected and new bids to be taken.

300 tons, dam, United States engineer, Providence, R. I.

300 tons, Knightsville dam, Massachusetts; bids in to army engineers, Providence, R. I.

290 tons, section 13-D, Pennsylvania turnpike, Bedford county, Pennsylvania.

275 tons, underpass, South Damen avenue and Seventy-fifth street, Chicago; Strobel Construction Co., Chicago, general contractor.

270 tons, Central high school, Cleveland; bids July 6.

268 tons, structures Black Canyon Canal, Boise project; bids to reclamation bureau, Boise, Ida., July 17; Spec. 856.

265 tons, Washington state highway projects; bids to Olympia July 11.

256 tons, Coast guard air station hangar and barracks, San Francisco; Wm. Wills, Presidio, Calif., low at $513,000.

250 tons, Southern parkway, S-39-39-2, New York.

200 tons, building, Rival Packing Co., Chicago.

150 tons or more, footings for Bonneville-Coulee main transmission line; Fritz Ziebarth, Long Beach, Cal., general contractor.

150 tons, swimming pool, Massachusetts Institute of Technology, Cambridge, Mass.

140 tons, bars and mesh, Branchville relocation, route S-31, section 4, Sussex county, New Jersey; bids July 14, E. Donald Sterner, state highway commissioner, Trenton.

130 tons, two schools, Bangor, Me.

130 tons, joists, garage, Halle Bros. Co., Cleveland; bids in.

125 tons, addition to Washburn vocational school, Chicago.

113 tons, joists, Kentucky school, Cleveland; bids in.

110 tons, dam, Surrey, N. H.

110 tons, Joint highway district No. 10, San Mateo county, California; bids opened.

100 tons, Francis Scott Key school, San Francisco; new bids July 5.

Unstated, state undercrossing Bend, Oreg.; Birkemeier & Saramel, Milwaukie, Oreg.; low at $116,577.

Unstated, state bridge, Josephine county, Oreg.; J. F. Johnston, Newberg, Oreg.; low.

Pig Iron

Pig Iron Prices, Page 78

Cleveland — Demand is slightly heavier from some foundries, but with a number of plants scheduling shutdowns for a short time during July, this month may see a letdown in iron shipments. A pickup in output of automotive castings is expected later this month, but barring an unusual rise in miscellaneous de-

mand, consumption will decline.

Chicago—June shipments were about 20 per cent below May. Last few days showed considerable slackening because of plant shutdowns for the holiday. A fair amount of contracting has been going on for third quarter iron, but buying is still mostly of a spot nature. Possibility is seen July shipments may show some improvement over June, with automotive and agricultural needs more active.

New York — Pig iron buying is light and in spot lots about in line with current foundry consumption. Releases are steady but contracting for third quarter is slow. Some irregular improvement has been noted in northern New Jersey and Brooklyn foundries but below expectations as to heating equipment producers.

Philadelphia — Consumer inventories are low and some sellers look for a buying movement to develop late this quarter. Soil pipe and stove makers are fairly busy. Sweden is inquiring for 1500 tons of foundry iron.

Buffalo—A seasonal tapering late in the month brought June shipments below May. The letdown has been fairly general.

Cincinnati—Shipments hold at the rate of a month ago, and sellers expect it will be necessary to extend few contracts into third quarter.

St. Louis — June shipments were off 10 to 15 per cent, but with stove and implement plants expected to increase operations after this week an upturn in deliveries is in prospect.

Toronto, Ont.—Sales are tapering, affected by the season. Orders for the week totaled about 1500 tons. Little forward contracting is being done. Production in May totaled 57,746 gross tons, against 46,254 tons in April.

Scrap

Scrap Prices, Page 80

Pittsburgh—Scrap releases were lighter last week and will be cut further by this week's shutdowns of some steelworks. Prices are unchanged, except for a $2 advance in borings and mixed borings and turnings on the basis of a large sale.

Cleveland—Strength characterizes the scrap market although buying is at a minimum. Steelmaking grades are scarce and offerings are light at present prices.

Chicago—Scrap prices are firm despite indicated easiness resulting from a mill purchase of No. 1 heavy melting steel at $13.50. While this was a reduction of 25 cents from the previous sale, brokers are unable to pick up this grade for less than $13.25, thereby shortening the quotable range to $13.25 to $13.50.

Boston — Export scrap prices tend upward on several grades. Better than $14 for No. 1 heavy melting steel, dock delivery, has been done at one port, but in the Boston district the price is unchanged at $14, with brokers still paying $13 for No. 2. No. 2 compressed bundles are also stronger for dock delivery, most going at $11.50, dock, although in a few instances slightly higher has been paid.

New York — Domestic buying of scrap is light by mills and foundries, with prices nominally unchanged and untested. Shipments from this district are unusually light and most activity is against export orders, which are large following June purchases by the European cartel, a large portion of which was for England.

Philadelphia — Brisk exports are maintaining firm prices for scrap. Brokers generally are paying $15 for No. 1 steel and $13.50 for No. 2 for export, with a 25-cent premium in instances.

Buffalo—The market is stalemated from the standpoint of new sales as dealers and consumers are unable to agree on prices. Mills continue to restrict shipments, one plant applying a complete embargo. Prices are nominally unchanged.

Detroit—Prices are unchanged, awaiting results of bidding on recent automotive lists. Demand for foundry grades is quieter, and sentiment in the market generally is a trifle easier, if anything.

Cincinnati—Dealers' prices are unchanged, and the market has a strong undertone. Consumer buying lately has been principally in cast grades for foundry use. Steel scrap is moving against commitments at a fair rate, but new business is light.

Toronto, Ont.—Prices are unchanged, with dealers looking for an upturn on the next move. A fairly heavy movement of heavy melting steel against contracts to Hamilton mills is reported.

Warehouse

Warehouse Prices, Page 79

Pittsburgh—Prices have strengthened along with an improvement in volume. June business was somewhat above May and the outlook is good. Miscellaneous demand has improved materially.

Chicago—Sales were off last week but less than expected in view of proposed closing of a number of plants this week.

Boston—June sales were close to May levels. Except for scattered shading, prices are steady and unchanged.

New York—Shipments last month were slightly below May, though orders were sustained in number. Lighter products are moving better than heavier items.

Philadelphia—A second-half pickup brought June sales slightly ahead of May. Business is well diversi-

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Buffalo Detroit New York Philadelphia Boston

fied, with light products most active.

Buffalo—June sales were maintained better than expected, comparing favorably with May and showing good diversification. Prices are fairly steady.

Cincinnati—Coal mines continue active warehouse customers and helped boost June sales about 20 per cent. Construction demand is disappointing.

St. Louis—A small gain over May is expected in final June totals. Building products, rural commodities and repair materials for coal mines moved better last month, with oil country goods the most active items.

Nonferrous Metal Prices

Spot unless otherwise specified. Cents per pound.

June	Copper Electro, del. Conn.	Copper Lake, del. Midwest	Copper Casting, refinery	Straits Tin, New York Spot	Straits Tin, New York Futures	Lead N. Y.	Lead East St. L.	Zinc St. L.	Aluminum 99%	Antimony Amer. Spot, N.Y.	Nickel Cathodes
24	10.00	10.00	9.52½	49.10	48.95	4.85	4.70	4.50	20.00	12.00	35.00
26	10.00	10.00	9.52½	49.05	48.80	4.85	4.70	4.50	20.00	12.00	35.00
27	10.00	10.00	9.52½	49.00	48.70	4.85	4.70	4.50	20.00	12.00	35.00
28	10.00	10.00	9.52½	48.95	48.70	4.85	4.70	4.50	20.00	12.00	35.00
29	10.00	10.00	9.52½	49.00	48.70	4.85	4.70	4.50	20.00	12.00	35.00
30	10.00	10.00	9.52½	49.00	48.65	4.85	4.70	4.50	20.00	12.00	35.00

MILL PRODUCTS

F.o.b. mill base, cents per lb., except as specified. Copper brass products based on 10.00c Conn. copper

Sheets

Yellow brass (high) 16.48
Copper, hot rolled 18.12
Lead, cut to jobbers 8.00
Zinc, 100 lb. base 9.75

Tubes

High yellow brass 19.23
Seamless copper 18.62

Rods

High yellow brass 11.85
Copper, hot rolled 14.62

Anodes

Copper, untrimmed 15.37

Wire

Yellow brass (high) 16.73

OLD METALS

Nom. Del. Buying Prices

No. 1 Composition Red Brass

New York 5.75-6.00
Cleveland 6.50-6.75
Chicago 5.75-6.00
St. Louis 6.00-6.25

Heavy Copper and Wire

New York, No. 1 ..... 7.75-7.87½
Cleveland, No. 1 ..... 7.75-8.00
Chicago, No. 1 ..... 7.37½-7.62½
St. Louis 7.50-7.75

Composition Brass Turnings

New York 5.00-5.25

Light Copper

New York 6.25-6.50
Cleveland 6.00-6.25
Chicago 5.75-6.00
St. Louis 6.00-6.25

Light Brass

Cleveland 3.50-3.75
Chicago 3.87½-4.12½
St. Louis 3.50-3.75

Lead

New York 4.00-4.25
Cleveland 3.75-4.00
Chicago 3.60-3.85
St. Louis 3.50-3.75

Zinc

New York 2.50-2.62½
Cleveland 2.00-2.25
St. Louis 2.25-2.50

Aluminum

Borings, Cleveland 6.25-6.50
Mixed, cast, Cleveland 7.75-8.00
Clips, soft, Cleveland 14.25-14.50
Misc. cast, St. Louis 7.00-7.25

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Steel in Europe

Foreign Steel Prices, Page 79

London — (*By Cable*) — Normal business transactions in the steel and iron markets of Great Britain are quieter, owing to uncertainties of the international situation. Steelworks are fully occupied for some time on defense contracts. The foundry pig iron market is slightly more active but hematite users are awaiting lower prices effective July 1. Purchases of Continental semi-finished steel continue large. Export trade is quiet.

The Continent reports export trade less active but the Near East, Dutch East Indies and South America continue to buy. Prices show some weakness. It is understood the international thin sheet cartel made no change in price at its recent meeting.

Iron Ore

Iron Ore Prices, Page 80

Steamer L. E. BLOCK of Inland Steel Co. last week set an all-time record in size of iron ore cargo on the Great Lakes. The boat was loaded with 15,728 gross tons of ore at Superior, Wis., barely exceeding the former record set by the same vessel in 1938, when it handled 15,726 tons on one trip.

Reserve Mining Co., subsidiary of Oglebay, Norton & Co., Cleveland, has been granted a 100-day option on mining properties in Minnesota and timber rights which Mesabi Iron Co. holds from the East Mesabi Iron Co. and Dunka River Iron Co. Mesabi controls 16,000 acres of low-grade ore lands in Minnesota which it was developing until June, 1924.

Nonferrous Metals

New York—A sudden spurt in foreign copper sales on Friday focused the spotlight on that metal whereas earlier in the week it had been on silver. The foreign cartel reported record breaking sales with business done up to 10.30c, c.i.f. European ports. Bulk of the business was booked through New York with the metal of foreign rather than domestic origin. Action of the senate in proposing to terminate the foreign silver purchase program resulted in a sharp decline in foreign silver prices to the lowest levels since 1933.

Copper—Heavy buying in the foreign market reflected renewed armament activity and possibly replen-

ishing of reserves abroad. It also emphasized tightness of nearby electrolytic supplies in the foreign market. The spurt abroad stimulated sales here but electrolytic held at 10.00c, Connecticut.

Lead—Turnover for the week was lighter than for the preceding period but some sellers had little difficulty in balancing their intakes on Friday. Prices held firm at 4.70c, East St. Louis.

Zinc—Sales held around 4000 tons for the week with prices unchanged at 4.50c, East St. Louis, for prime western.

Tin—Both sales and prices again held unusually steady with Straits spot closing at 49.00c.

Equipment

New York — Machine tool orders continue in good volume, mostly for replacement, with specifications for one or two tools frequent. The airplane industry, expanding in some instances, is buying steadily, and more business is in prospect from shipyards. Government shops are placing a few tools, with indications this will continue for some time. Most machine builders have substantial backlogs and deliveries on some lines are further extended.

Chicago—June was a good month for local machinery interests, reports indicating it second only to March in volume of business. Some interests found June business almost double that of May, which was a poor month. Current demand is widely scattered but includes substantial support from foundries, navy contracts, sheet metal interests, boiler works and railroads. First few days of July will be quiet, but second week will see increased business.

Seattle — Bonneville Authority, Portland, continues as one of the active buyers in this area.

Construction and Enterprise

Ohio

ENGLEWOOD, O.—Village, W. E. Colley, mayor, will probably take bids immediately on a sanitary sewer system and a sewage disposal plant costing in all $90,994. Involves tanks, filters, valves, gates, screens, settling chambers and filter beds. George Stellar, Dayton, O., consulting engineer.

SHELBY, O.—City, D. B. Young, mayor, has practically completed its plans and is to take bids July 1 on projected improvements to its light and power plant. City engineer, J. P. Adkins. (Noted June 12.)

VERSAILLES, O.—City, Ralph Pittensbarger, clerk, is drawing up plans and will be ready for bids by end of July on construction of sewers and sewage disposal plant costing total of $129,000.

WEST FARMINGTON, O.—Village, F. S. Hart, mayor, will issue mortgage bonds and apply for PWA funds in program involving a new waterworks costing $63,000. Includes 100-foot tower and 75,000-gallon tank. Consultants, Carl J. Simons & Associates, Van Wert, O.

Massachusetts

GREENFIELD, MASS.—Greenfield Tap & Die Corp. has plans underway for a new factory unit costing more than $40,000. Equipment will be needed.

Rhode Island

WEST WARWICK, R. I.—Town, E. J. Mailloux, sewer committee, asks bids on contract 7 for sewage treatment plant costing over $25,000. Jenks & Ballou, Providence, R. I., consulting engineers.

New York

GOUVERNEUR, N. Y.—U. S. Steel Corp., New York, is making plans for a zinc plant costing over $40,000.

New Jersey

NEW BRUNSWICK, N. J.—Johnson & Johnson, R. W. Johnson, chairman of board, 500 George street, plans to construct a $600,000 experimental plant.

TRENTON, N. J.—American Bridge Co. is making improvements in its plant at cost of over $75,000.

Pennsylvania

AMBRIDGE, PA.—American Bridge Co., A. Baumgartner, in charge, is improving its plant at cost of more than $100,000 including new equipment.

MEADVILLE, PA.—Northwestern Rural Electric Co-operative Association Inc., Bruce Hecker, superintendent, has received an additional $146,000 REA allotment and soon will erect 135 miles rural electric power transmitting lines in two counties.

Michigan

PORTLAND, MICH.—Tri-county Electric Co-operative Inc., Dolph Wolf, superintendent, has been allotted $292,500 by REA for constructing rural electric lines and a generating plant addition.

Illinois

LOUISVILLE, ILL.—City has plans for a sanitary sewerage system and sewage disposal plant complete with all equipment and appurtenances at total cost of $80,000. Russell & Axon, St. Louis, consulting engineers.

VIRGINIA, ILL.—City takes bids to July 25 on sanitary sewers and sewage treatment plant costing over $100,000. Engineering Service Corp., Decatur, Ill., consultant.

Indiana

RUSHVILLE, IND.—City, board of public works, C. B. Jordan, secretary, asks bids to July 6 on power plant improvements. Part of $180,000 PWA project. Bevington-Williams Inc., Indianapolis, consulting engineer.

WABASH, IND.—American Rock Wool Co. plans to construct plant additions costing a total of $90,000 with production equipment and appurtenances.

Florida

KEYSTONE HEIGHTS, FLA. — Clay Electric Co-operative association, Albertus Miller, president, receives bids for 249 miles of rural electric lines. A. P. Michael, Orlando, Fla., engineer.

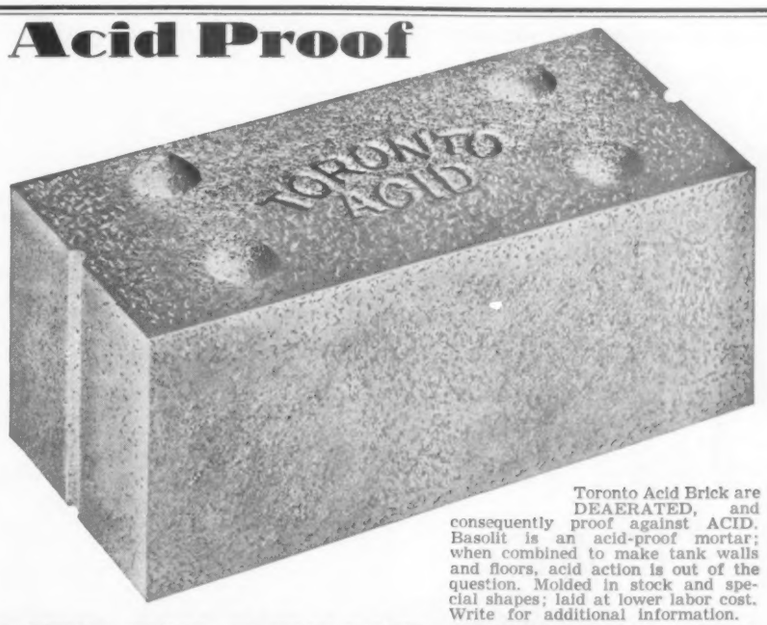
Georgia

MARIETTA, GA.—Cobb County Electrical Membership Corp. has received a $112,000 REA allotment for construction of 129 additional miles of rural electric power lines in four counties.

Mississippi

MERIDIAN, MISS.—City has plans for waterworks improvements including a 5,000,000-gallon reservoir. Total cost of

Acid Proof



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project estimated at $300,000. J. C. Watts, Meridian, engineer.

Tennessee

ADAMSVILLE, TENN.—Pickwick Electric Membership Corp. has been allotted $411,000 by REA for 158 miles of rural electric power lines in two counties.

Louisiana

MORGAN CITY, LA.—City will vote July 18 on proposal to issue $110,000 bonds to finance improvements in its waterworks and electric light and power plant.

West Virginia

MARLINTON, W. VA.—Peerless Coal & Iron Co., Charleston, W. Va., will close bids by July 20 on construction of projected plant.

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GARAGE IN CONNECTION

Missouri

NEOSHE, MO.—REA has allotted a $299,000 loan to the New-Mac Electric co-operative, W. H. Higginbotham, president, to finance 318 miles rural transmission lines through two counties.

Wisconsin

BOSCOBEL, WIS. — Tri-state Power Electric co-operative receives bids until July 11 for a steam power generating plant costing $625,000 with equipment. A. Y. Taylor & Co., St. Louis, engineers.

Texas

ARLINGTON, TEX.—R. C. Can Co., care of A. Bailey, Burkburney building, Ft. Worth, Tex., has awarded contract for a can manufacturing plant costing $50,000 to Quisle & Andrews, Ft. Worth. (Noted May 29.)

BROWNSVILLE, TEX.—Woburn Industries, Harrison N. J., has plans for a manufacturing plant at cost of approximately $165,000.

DALLAS, TEX. — Weaver Spring & Bumper Works has been incorporated with capital of $50,000 by Sam E. Tiggert, W. O. Alvis and J. E. Dickinson to fabricate steel and iron products.

HOUSTON, TEX.—Alexson Mfg. Co., Los Angeles, plans to construct a plant for producing oil well pumping equipment. Cost estimated to total $250,000.

LONGVIEW, TEX.—O. H. Grissom & Associates propose to construct at cost of $160,000 an iron ore reduction plant using the natural gas process.

Kansas

McPHERSON, KANS. — City, Ellen Lundstrom, clerk, has approved bond issue to finance the proposed addition to its power plant. Includes turbine, condenser and switchgear. Burns & McDonnell Engineering Co., Kansas City, Mo., consultant. (Noted March 27.)

North Dakota

BAKER, N. DAK.—REA has allotted $117,000 to Baker Electric co-operative, Palmer Stadum, superintendent, to finance 134 miles rural power transmitting lines serving four counties.

South Dakota

ALCESTER, S. DAK.—REA has allotted $111,500 to Lincoln Union Electric Co., Harold Swanson, superintendent, to finance 99 miles rural electric power transmission lines. Pillsbury Engineering Co., Minneapolis, consultant.

VERMILION, S. DAK.—University of South Dakota, board of regents, is drawing plans for improving its power plant at estimated cost of $50,000. Will erect new addition with boilers and pumps. Walter Dixon, Medical Arts building, Mitchell, S. Dak., engineer.

VOLGA, S. DAK.—City, Charles Lee, mayor, will vote on proposal to issue $40,000 bonds to finance a municipal light and power plant.

Iowa

CORNING, IOWA — Adams County Electric co-operative, R. E. Phillips, superintendent, takes bids to 10 a.m., July 11, on construction of transmission lines through five counties. Young & Stanley, Muscatine, Iowa, consulting engineers. (Noted May 15.)

DAVENPORT, IOWA—REA has allotted $340,000 to Eastern Iowa Light & Power co-operative to finance construction of 283 miles of rural transmission lines serving consumers in six counties.

NEW HAMPTON, IOWA—City has voted to expend $183,120 for a new 1000-kilowatt turbo-generator and auxiliaries, installing superheaters in boilers and remodeling its electric power plant. J. W. Wittenburg, city engineer. (Noted June 5.)

THOMPSON, IOWA—Winnebago Rural Electric co-operative, C. M. Palmer, president, is accepting bids until 10 a.m., July 6, on the construction of 258 miles rural electric power lines serving three counties. Young & Stanley, Muscatine, Iowa, consultants.

WOODBINE, IOWA—City takes bids to July 24 on light and power plant construction. Involved are three diesel generating units, switchboard and distributing system costing total of $115,000. A. S. Harrington, Omaha, Nebr., consulting engineer. (Noted May 15.)

Colorado

MONTE VISTA, COLO.—San Luis Valley Rural Electric co-operative has been allotted $60,000 by REA for 68 miles of rural transmission lines.

TRINIDAD, COLO.—Stonewall Electric Co. has received a $65,000 REA allotment for projected construction of 67 miles rural power transmitting lines.

Wyoming

KEMMERER, WYO.—Lincoln Service Corp., R. M. Turner, president, proposes to remodel its electric plant with new generator, switchboard, condenser, lightning arresters, power lines and other equipment. Cost estimated at $125,000.

Pacific Coast

LOS ANGELES—Certificate to conduct business under firm name of Acme Machine Works, 6607 South San Pedro street, has been issued to co-owner Fred Steinel.

LOS ANGELES—Monarch Pipe & Engineering Co. has been incorporated with 2500 shares capital stock. G. A. Bisbee, Los Angeles, is a director.

LOS ANGELES—Fonda Machinery Co. Inc. has been organized with capital of $25,000. MacFarlane, Schaefer, Haun and Mulford, 417 South Hill street, representatives.

MARTINEZ, CALIF.—Shell Oil Co., San Francisco, plans to expend $650,000 in improving refinery in distillation unit No. 4, involving a new gasoline stabilizer and reconditioning alcohol plant.

OAK HARBOR, WASH.—City seeks WPA allotment in proposal to construct sewers and sewage disposal plant costing $37,000. H. Munn, Everett, Wash., consulting engineer.

TACOMA, WASH. — Universal Metals Products Co., 1120 Washington building, has been incorporated with capital of $10,000 by Lloyd H. Moss & Associates. A foundry will be established.

Canada

LONDON, ONT.—Kelvinator of Canada Ltd., C. W. Hadden, general manager, proposes to construct an 85 x 100-foot addition to its factory at cost of $50,000.

BEDFORD, QUE.—Torrington Co. Ltd. has awarded contract for a $40,000 needle manufacturing plant to Stewart Construction Ltd., Sherbrooke, Que.

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Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

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Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

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*Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Roller Bearing Co., The, Canton, O.
Weirton Steel Co., Weirton, W. Va.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

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American Hard Rubber Co., 11 Mercer St., New York City.

BATTERIES (Storage)
Electric Storage Battery Co., The, 19th St. and Allegheny Ave., Philadelphia, Pa.

BEAMS, CHANNELS, ANGLES, ETC. (*Also Stainless)
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

BEARINGS (Ball)
Ahlberg Bearing Co., 3025 W. 47th St., Chicago, Ill.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
New Departure Div., General Motors Corp., Bristol, Conn.
Norma Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Torrington Co., The, Torrington, Conn.

BEARINGS (Babbitt)
Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.

BEARINGS (Brass, Bronze)
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O

BEARINGS (Journal)
Ahlberg Bearing Co., 3025 W. 47th St., Chicago, Ill.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Division, General Motors Corp., Harrison, N. J.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Needle)
Torrington Co., The, Torrington, Conn.

BEARINGS (Oilless)
Rhoades, R. W., Metaline Co., 50 3rd St., Long Island City, N. Y.

BEARINGS (Quill)
Bantam Bearings Corp., South Bend, Ind.,

BEARINGS (Radial)
Ahlberg Bearing Co., 3025 W. 47th St., Chicago, Ill.
American Roller Bearing Co., 416 Melwood St., Pittsburgh, Pa.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
New Departure Div., General Motors Corp., Bristol, Conn.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.
SKF Industries, Inc., Front St., and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Roll Neck)
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
Morgan Construction Co., Worcester, Mass.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Roller)
Ahlberg Bearing Co., 3025 W. 47th St., Chicago, Ill.
American Roller Bearing Co., 416 Melwood St., Pittsburgh, Pa.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Norma Hoffmann Bearings Corp., Stamford, Conn.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Roller Tapered)
Ahlberg Bearing Co., 3025 W. 47th St., Chicago, Ill.
Bantam Bearings Corp., South Bend, Ind.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Rolling Mill)
American Roller Bearing Co., 416 Melwood St., Pittsburgh, Pa.
Bantam Bearings Corp., South Bend, Ind.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
Morgan Construction Co., Worcester, Mass.
Norma Hoffmann Bearings Corp., Stamford, Conn.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Self-Aligning Roller)
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.

BEARINGS (Thrust)
Ahlberg Bearing Co., 3025 W. 47th St., Chicago, Ill.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Norma Hoffmann Bearings Corp., Stamford, Conn.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BELTING (Metal, Conveyor, High and Low Temperature)
Cyclone Fence Co., Waukegan, Ill.

BELTING (Rubber)
Goodyear Tire & Rubber Co., Akron, O.
United States Rubber Co., 1790 Broadway, New York City.

BENDING AND STRAIGHTENING MACHINES
Alliance Machine Co., The, Alliance, O.
Cleveland Punch & Shear Works, 3917 St. Clair Ave., Cleveland, O.
Kardong Bros., Inc., 346 Buchanan St., Minneapolis, Minn.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Thomas Machine Mfg. Co., Pittsburgh, Pa.

BENZOIL AND TOLUOL RECOVERY PLANTS
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.
Koppers Co., The, Tar & Chemical Div., Pittsburgh, Pa.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.
Youngstown Sheet & Tube Co., Youngstown, O.

BILLETS (Alloys and Carbon Steel)
Alan Wood Steel Co., Conshohocken, Pa.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Firth-Sterling Steel Co., McKeesport, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Republic Steel Corp., Dept. ST, Cleveland, O.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Washburn Wire Co., Phillipsdale, R. I.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

BILLETS (Forging)
Alan Wood Steel Co., Conshohocken, Pa.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Jones and Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

BILLETS AND BLOOMS (*Also Stainless)
*Alan Wood Steel Co., Conshohocken, Pa.
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
*Firth-Sterling Steel Co., McKeesport, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

BINS (Storage)
Petroleum Iron Works Co., Sharon, Pa.

BLAST FURNACE CLEANING (Gas)
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

BLAST FURNACE SPECIALTIES
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill.
Brosius, Edgar E., Inc., Sharpsburg, Pa.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

BLAST FURNACES—See FURNACES (Blast)

BLOCKS (Chain)
Ford Chain Block Co., York, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

BLOWPIPES (Hand and Stand)
American Gas Furnace Co., Elizabeth, N. J.

BLOWERS
American Gas Furnace Co., Elizabeth, N. J.
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., 11 Broadway, New York City.
Sawyer Electrical Mfg. Co., 5715 Leneve St., Los Angeles, Cal.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Trufio Fan Co., Harmony, Pa.

BLOWPIPES (Air—Gas)
American Gas Furnace Co., Elizabeth, N. J.

BLOWPIPES (Oxy-Acetylene)
Linde Air Products Co., The, 30 E. 42nd St., New York City.

BOILER HEADS
Bethlehem Steel Co., Bethlehem, Pa.

BOILER TUBES—See TUBES (Boiler)

BOILERS
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Oil Well Supply Co., Dallas, Texas.

BOLT AND NUT MACHINERY
Landis Machine Co., Inc., Waynesboro, Pa.

BOLTS (*Also Stainless)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

BOLTS (Carriage and Machine)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.

BOLTS (Special)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

BOLTS (Stove)
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.

BOLTS (Stove, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, Cleveland, O.
National Screw & Mfg. Co., Cleveland, O.
Pheoll Mfg. Co., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

BOLTS (Track)—See TRACK BOLTS

BORING MACHINES (Precision)
Heald Machine Co., Worcester, Mass.

BOXES (Annealing)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
National-Erie Corp., Erie, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Union Steel Casting Co., 62nd & Butler Sts., Pittsburgh, Pa.
United Engineering & Foundry Co., First National Bank Bldg., Pittsburgh, Pa.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

BOXES (Open Hearth Charging)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.
Petroleum Iron Works Co., Sharon, Pa.

BRAKE LININGS
Wagner Electric Corp., 4904 Baum Blvd., Pittsburgh, Pa.

BRAKES (Electric)
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

BRAKES (Hydraulic)
Wagner Electric Corp., 4904 Baum Blvd., Pittsburgh, Pa.

BRAKES (Press)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.

BRAZING EQUIPMENT
American Gas Furnace Co., Elizabeth, N. J.

BRICK—(Insulating)—See INSULATING BRICK

BRICK (Refractory)—See REFRACTORIES, CEMENT, ETC.

BRICK (Acid Resisting)
Keagler Brick Co., 1443 W. Market St., Steubenville, O.

BRICK (Silicon Carbide)
Carborundum Co., The, Perth Amboy, N. J.
Norton Co., Worcester, Mass.

BRIDGE CRANES (Ore and Coal Handling)—See CRANES (Bridge)

BRIDGES, BUILDINGS, VIADUCTS, STACKS, ETC.
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Belmont Iron Works, 22nd St., and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Blaw-Knox Co., Blawnox, Pa.
Columbia Steel Co., San Francisco, Calif.
Petroleum Iron Works Co., Sharon, Pa.

BROACHING MACHINES
Bullard Co., The, Bridgeport, Conn.
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.

BRUSHES (Industrial)
Pittsburgh Plate Glass Co., Brush Div., Baltimore, Md.

BUCKETS (Clam Shell, Dragline Grab, Single Line)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Blaw-Knox Co., Blawnox, Pa.
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.

BUCKETS (Single Hook, Automatic Dump, Automatic Single Line)
Brosius, Edgar E., Inc., Sharpsburg, Pa.

BUILDINGS (Steel)—See BRIDGES, BUILDINGS, ETC.

BULLDOZERS
Beatty Machine & Mfg. Co., Hammond, Ind.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

BUNGS (Rubber)
Rhoades, R. W., Metaline Co., 50 Third St., Long Island City, N. Y.

BURNERS (Acetylene)—See TORCHES AND BURNERS

BURNERS (Automatic)
American Gas Furnace Co., Elizabeth, N. J.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
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Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

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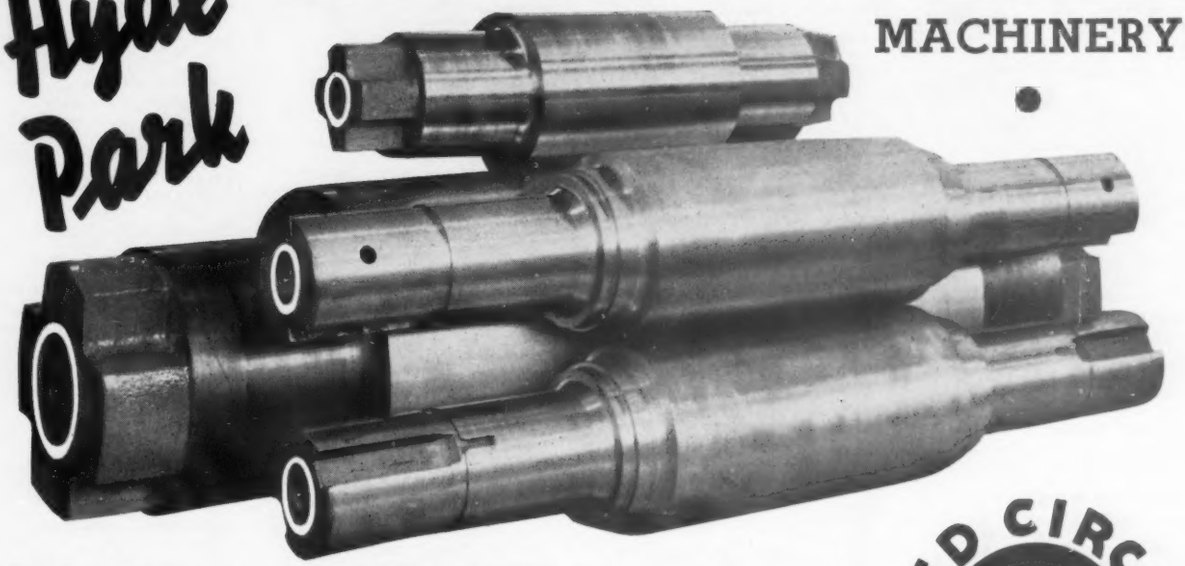

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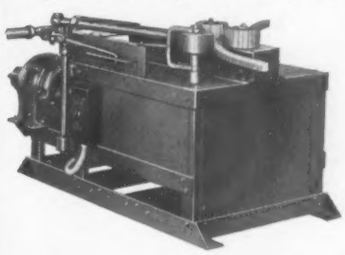

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Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

BUSHINGS (Bronze)
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.
Shenango-Penn Mold Co., Dover, O.

BUSHINGS (Oilless)
Rhoades, R. W., Metaline Co., 50 3rd St., Long Island City, N. Y.

BY-PRODUCT PLANTS
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

CAISSONS (Pneumatic)
Dravo Corp., (Contracting Div.), Neville Island, Pittsburgh, Pa.

CALCIUM METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

CAP SCREWS—See SCREWS (Cap, Set, Safety-Set)

CAR DUMPERS
Alliance Machine Co., The, Alliance, O.
Industrial Brownhoist Corp., Bay City, Mich.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CAR PULLERS and SPOTTERS
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.
Link-Belt Co., 2410 W. 18th St., Chicago, Ill.

CARBIDE
Linde Air Products Co., The 30 E. 42nd St., New York City.
National Carbide Corp., 60 E. 42nd St., New York City.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.

CARBURIZERS
Houghton, E. F. & Co., 240 W. Somerset St., Philadelphia, Pa.

CARS (Charging)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.

CARS (Industrial and Mining)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Petroleum Iron Works Co., Sharon, Pa.

CARS (Scale)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

CASTINGS (Acid Resisting)
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
International Nickel Co., Inc., The, 67 Wall St., New York City.
Meehanite Metal Corp., Pittsburgh, Pa.
National Alloy Steel Co., Blawnox, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.

CASTINGS (Alloy Steel)
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Damascus Steel Casting Co., New Brighton, Pa.
Ohio Steel Fdry. Co., Lima, O.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell St., Chicago, Ill.
Union Steel Casting Co., 62nd and Butler Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Brass, Bronze, Copper, Aluminum)
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.
Titan Metal Mfg. Co., Bellefonte, Pa.

CASTINGS (Brass, Pressure)
Titan Metal Mfg. Co., Bellefonte, Pa.

CASTINGS (Die)—See DIE CASTINGS

CASTINGS (Electric Steel)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Damascus Steel Casting Co., New Brighton, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
National-Erie Corp., Erie, Pa.
West Steel Casting Co., 805 E. 70th St., Cleveland, O.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Gray Iron, Alloy, or Semi-Steel)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Columbia Steel Co., San Francisco, Calif.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Oil Well Supply Co., Dallas, Texas.
Shenango Penn Mold Co., Dover, O.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

CASTINGS (Heat Resisting)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
National Alloy Steel Co., Blawnox, Pa.
Shenango Penn Mold Co., Dover, O.

CASTINGS (Malleable)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Erie Malleable Iron Co., W. 12th & Cherry Sts., Erie, Pa.
Lake City Malleable Co., 5026 Lakeside Ave., Cleveland, O.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.
Peoria Malleable Castings Co., Peoria, Ill.

CASTINGS (Manganese Steel)
Damascus Steel Casting Co., New Brighton, Pa.

CASTINGS (Steel) (*Also Stainless)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Damascus Steel Casting Co., New Brighton, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Koppers Co., Western Gas Div., Fort Wayne, Ind.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
National-Erie Corp., Erie, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O.
Oil Well Supply Co., Dallas, Texas.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Steel Founders' Society of America, 920 Midland Bldg., Cleveland, O.
Strong Steel Fdy. Co., Hertel & Norris Ave., Buffalo, N. Y.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Union Steel Casting Co., 62nd and Butler Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
West Steel Casting Co., 805 E. 70th St., Cleveland, O.

CASTINGS (Wear Resisting)
Meehanite Metal Corp., Pittsburgh, Pa.
Shenango Penn Mold Co., Dover, O.

CASTINGS (Worm and Gear Bronze)
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.

CEMENT (Acid Proof)
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

CEMENT (High Temperature)
Carborundum Co., The, Perth Amboy, N. J.
Norton Company, Worcester, Mass.

CEMENT (Refractory, High Temperature)
Johns-Manville Corp., 22 E. 40th St., New York City.

CENTRAL STATION EQUIPMENT
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CHAIN (Draw Bench)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CHAIN (Malleable)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Lake City Malleable Co., 5026 Lakeside Ave., Cleveland, O.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Roller)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.

CHAIN (Sprocket)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Peoria Malleable Castings Co., Peoria, Ill.

CHAIN (Steel-Finished Roller)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.

CHAIN (Welded or Weldless)
American Chain & Cable Co., Bridgeport, Conn.

CHARGING MACHINES (Cupola)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Lake Erie Engineering Corp., Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., The, Alliance, O.

CHARGING MACHINES (Open Hearth)
Morgan Engineering Co., The, Alliance, O.

CHARGING MACHINES AND MANIPULATORS (Autofloor Type)
Brosius, Edgar E., Inc., Sharpsburg, Pa.

CHECKER BRICK
Loftus Engineering Corp., 509 Oliver Bldg., Pittsburgh, Pa.

CHROME ORE
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

CHROMIUM METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

CHUCKS (Automatic Closing)
Tomkins-Johnson Co., 611 N. Mechanics St., Jackson, Mich.

CLEANING SPECIALTIES
American Chemical Paint Co., Ambler, Pa.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

CLUTCHES (Friction)
Jones, W. A., Fdry. & Mach. Co., 4401 W. Roosevelt Rd., Chicago, Ill.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CLUTCHES (Friction, Overrunning Single Revolution)
Hilliard Corp., The, 100 W. 4th St., Elmira, N. Y.

CLUTCHES (Magnetic)
Dings Magnetic Separator Co., 675 Smith St., Milwaukee, Wis.

COAL OR COKE
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Koppers Co., The, Gas & Coke Div., Pittsburgh, Pa.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Koppers Coal Co., Koppers Bldg., Pittsburgh, Pa.
New England Coal & Coke Co., Boston, Mass.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., Youngstown, O.

COAL, COKE, ORE AND ASH HANDLING MACHINERY
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Koppers Co., Engineering & Construction Div., Pittsburgh, Pa.
Koppers-Rheolaveur Co., Pittsburgh, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

COKE—See COAL OR COKE

COKE OVEN MACHINERY
Alliance Machine Co., The, Alliance, O.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

COKE OVENS (By-Product)
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

WHERE-TO-BUY

COKE SCREENING PLANTS
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

COLUMBIUM
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

COMBUSTION BULBS
Norton Company, Worcester, Mass.

COMBUSTION CONTROLS
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.
Morgan Construction Co., Worcester, Mass.
Norton Company, Worcester, Mass.

COMPARATORS (Optical)
Jones & Lamson Machine Co., Springfield, Vt.

COMPENSATORS (Automatic)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

COMPRESSORS (Air)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Gas Furnace Co., Elizabeth, N. J.
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., 11 Broadway, New York City.
Worthington Pump & Compressor Corp., Harrison, N. J.

CONCRETE REINFORCING BARS —See BARS (Concrete Reinforcing)

CONDENSERS (Surface, Barometric, Multi-Jet)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.
Worthington Pump & Machinery Corp., Harrison, N. J.

CONDUITS (Electric)
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Youngstown Sheet & Tube Co., Youngstown, O.

CONDUITS (Pressure-Treated Wood)
Wood Preserving Corp., The, Koppers Bldg., Pittsburgh, Pa.

CONNECTING RODS
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Mesta Machine Co., P. O. Box 1466 Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

CONTRACTORS—See ENGINEERS AND CONTRACTORS

CONTROL SYSTEMS (Automatic)
American Gas Furnace Co., Elizabeth, N. J.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

CONTROLLERS (Combustion)—See COMBUSTION CONTROLS

CONTROLLERS (Electric)
Allen-Bradley Co., 1326 So. Second St., Milwaukee, Wis.
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.

CONTROLS (Temperature)
American Gas Furnace Co., Elizabeth, N. J.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

CONVEYOR BELTS (High and Low Temperature)
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

CONVEYOR BELTS (Wire)
Cyclone Fence Co., Waukegan, Ill.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

CONVEYORS (Apron)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Chain)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Elevating)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Overhead Trolley)
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

CONVEYORS (Roller—Power and Gravity)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

COPPER (Phosphorized)
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.

COPPERING COMPOUND
American Chemical Paint Co., Ambler, Pa.

COTTER PINS
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.

COUPLERS (Hose, Instantaneous—Air and Water)
Hunt, C. B., & Son, Salem, O.

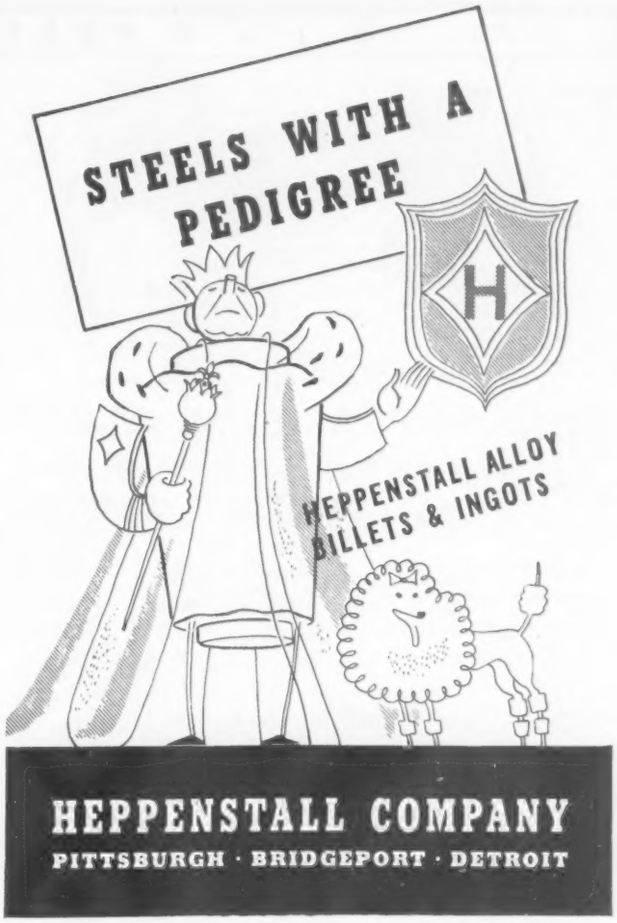
COUPLERS (Valving, Safety—Air and Water)
Hunt, C. B., & Son, Salem, O.

COUPLINGS (Flexible)
Ajax Flexible Coupling Co., Westfield, N. Y.
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
344 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5301 S. Western Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Hilliard Corp., The, 100 W. 4th St., Elmira, N. Y.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1114 W. Monroe St., Chicago, Ill.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Poole Fdy. & Mach. Co., Woodberry St., Baltimore, Md.
Waldron, John, Corp., New Brunswick, N. J.

COUPLINGS (Pipe)
Bethlehem Steel Co., Bethlehem, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas
Republic Steel Corp., Dept ST, Cleveland, O.
Youngstown Sheet & Tube Co., Youngstown, O.

CRANES, BRIDGE (Ore and Coal Handling)
Alliance Machine Co., The, Alliance, O.
Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.
Industrial Brownhoist Corp., Bay City, Mich.

CRANES (Charging)
Alliance Machine Co., The, Alliance, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Shepard Niles Crane & Hoist Corp. Montour Falls, N. Y.



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Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.

CRANES (Electric)
Alliance Machine Co., The, Alliance, O.
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

CRANES (Gantry)
Alliance Machine Co., The, Alliance, O.
Cleveland Crane & Engineering Co., Wickliffe, O.
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
Ohio Locomotive Crane Co., Bucyrus, O.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANES (Gasoline and Diesel)
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.

CRANES (Hand)
American Chain & Cable Co., Bridgeport, Conn.
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Crane & Engineering Co., Wickliffe, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo
Industrial Brownhoist Corp., Bay City, Mich.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa

CRANES (Jib)
Alliance Machine Co., The, Alliance, O.
American Chain & Cable Co., Bridgeport, Conn.
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

CRANES (Locomotive)
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.

CRANES (Monorail)
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Shepard Niles Crane & Hoist Corp. Montour Falls, N. Y.

CRANK SHAFTS
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Union Drawn Steel Co., Massillon, O.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

CRUSHERS
American Pulverizer Co., 1249 Macklind Ave., St. Louis, Mo.

CRUSHERS (Ring)
American Pulverizer Co., 1249 Macklind Ave., St. Louis, Mo.

CUSHIONS (Pneumatic)
Cleveland Punch & Shear Works, 3917 St. Clair Ave., Cleveland, O.

CUTTERS (Die Sinking & End Milling)
Barber Colman Co., 150 Loomis St., Rockford, Ill.
Tomkins-Johnson Co., 611 N. Mechanics St., Jackson, Mich.

CUTTERS (Gang Slitter)
Cowles Tool Co., 2086 W. 110th St., Cleveland, O.

CUTTING AND WELDING—See WELDING

CUTTING OILS—See OILS (Cutting)

CYLINDERS (Air or Hydraulic)
American Hollow Boring Co., 1054 W. 20th St., Erie, Pa.
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Tomkins-Johnson Co., 611 N. Mechanics St., Jackson, Mich.

CYLINDERS (Pressure)
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pressed Steel Tank Co. Milwaukee, Wis.

DEGREASERS
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

DEOXIDIZERS
Vanadium Corp. of America, 420 Lexington Ave., New York City.

DIE BLOCKS
Heppenstall Co., 47th and Hatfield Sts., Pittsburgh, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.

DIE CASTINGS
Titan Metal Mfg. Co., Bellefonte, Pa.

DIE HEADS
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.

DIE-SINKING MACHINES
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.

DIES (Cast)
Advance Foundry Co., The, 100 Parnell Ave., Dayton, O.
Farrel-Birmingham Co., Inc., 110 Maine St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.

DIES (Punching, Stamping, Blanking)
Budd, Edw. G., Mfg. Co., 25th St. & Huntington Park Ave., Philadelphia, Pa.
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.

DOORS & SHUTTERS (Steel, Fire, and Rolling)
Kinnear Mfg. Co., 818 Field Ave., Columbus, O.

DOORS FOR COKE OVENS (Automatic Self Sealing)
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

DRAFT GAGES (Indicating, Recording)
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

DRILL RODS—See RODS (Drill)

DRILLING MACHINES (Multiple, Heavy Duty)
Thomas Machine Mfg. Co., Pittsburgh, Pa.

DRILLING MACHINES (Radial)
Cleveland Punch & Shear Works, 3917 St. Clair Ave., Cleveland, O.
Thomas Machine Mfg. Co., Pittsburgh, Pa.

DRILLS (Portable—Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

DRILLS (Twist)—See TWIST DRILLS

DRIVES (Chain)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Simonds Gear & Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.

DRIVES (Cut Herringbone Gear)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5301 S. Western Ave., Chicago, Ill.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

DRIVES (Multi-V-Belt)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

DRIVES (Reciprocating)
Ajax Flexible Coupling Co., Westfield, N. Y.

DRUMS (Magnetic)
Dings Magnetic Separator Co., 675 Smith St., Milwaukee, Wis.

DRUMS (Steel)
Petroleum Iron Works Co., Sharon, Pa.
Pressed Steel Tank Co., Milwaukee, Wis.

DRYERS (Compressed Air)
Ruemelin Mfg. Co., 3860 N. Palmer St., Milwaukee, Wis.

DUST ARRESTING EQUIPMENT
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Research Corp., 405 Lexington Ave., New York City.
Ruemelin Mfg. Co., 3860 N. Palmer St., Milwaukee, Wis.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

ECONOMIC SERVICE
Brookmire Corp., 551 Fifth Ave., New York City.

ECONOMIZERS
Babcock & Wilcox Co., The, 19 Rector St., New York City.

ELECTRIC WELDING—See WELDING

ELECTRIC WIRING—See WIRE AND CABLE

ELECTRICAL EQUIPMENT
Allen-Bradley Co., 1326 So. Second St., Milwaukee, Wis.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.

ELEVATING AND CONVEYING MACHINERY—See CONVEYORS

ENGINEERS AND CONTRACTORS
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill.
Hunt, C. H., 1213 First National Bank Bldg., Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

ENGINEERS (Consulting)
Brassert, H. A., & Co., 310 So. Michigan Ave., Chicago, Ill.
Hunt, C. H., 1213 First National Bank Bldg., Pittsburgh, Pa.
Lindemuth, Lewis, B., 134 E. 47th St., New York City.
Loftus Engineering Corp., 509 Oliver Bldg., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

ENGINEERS, CONSULTING (By-Products Coke Oven & Gas Plants)
Koppers Co. Engineering and Construction Div., Pittsburgh, Pa.

ENGINES (Gas, Oil)
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
Worthington Pump & Machinery Corp., Harrison, N. J.

ENGINES (Steam)
Oil Well Supply Co., Dallas, Texas.

FACING MACHINES (Structural)
Thomas Machine Mfg. Co., Pittsburgh, Pa.

FANS (Crane Cab)
Truflo Fan Co., Harmony, Pa.

FANS (Exhaust, Ventilating)
Sturtevant, B. F., Co. Hyde Park, Boston, Mass.
Truflo Fan Co., Harmony, Pa.

FANS (Portable)
Perkins, B. F., & Son, Inc., Holyoke, Mass.
Truflo Fan Co., Harmony, Pa.
Wagner Electric Corp., 4904 Baum Blvd., Pittsburgh, Pa.

FANS (Wall)
Truflo Fan Co., Harmony, Pa.

FENCING (Wire)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Cyclone Fence Co., Waukegan, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.

FERROALLOY (Briquets)
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

FERROALLOYS
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Electro-Metallurgical Sales Corp., 30 E. 42nd St., New York City.
International Nickel Co., Inc., The, 67 Wall St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROCHROME
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROMANGANESE
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FERROPHOSPHORUS
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FERROSILICON
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROSILICON (Aluminum)
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROTITANIUM
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROVANADIUM
Electro Metallurgical Sales Corp. 30 E. 42nd St., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FILES AND RASPS
Simonds Saw & Steel Co., Fitchburg, Mass.

FILTER CLOTH (Asbestos)
Johns-Manville Corp., 22 E. 40th St., New York City.

FIRE DOORS & SHUTTERS—See DOORS & SHUTTERS

FIRE EXTINGUISHERS
Kidde, Walter, & Co., 140 Cedar St., New York City.

FIRESTONE (Silica)
National Stone Co., Ellwood City, Pa.

FLAME HARDENING
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., 30 E. 42nd St., New York City.
National-Erie Corp., Erie, Pa.

FLANGES (Forged Steel)
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.

WHERE-TO-BUY

FLANGES (Welded Steel)
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.

FLOORING (Monolithic)
Johns-Manville Corp., 22 E. 40th St., New York City.

FLOORING (Steel)
Alan Wood Steel Co., Conshohocken, Pa.
Blaw-Knox Co., Blawnox, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Dravo Corp. (Machinery Div.), Neville Island, Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc. 16th & Rockwell Sts., Chicago, Ill.
Tri-Lok Co., Neville Island, Pittsburgh, Pa.

FLUE DUST CONDITIONERS
Brosius, Edgar E., Inc., Sharpsburg, Pa.
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

FLUE GAS ANALYZERS
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

FLUORSPAR
Hillside Fluor Spar Mines, 38 So. Dearborn St., Chicago, Ill.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FLUXES (Soldering, Welding & Tinning)
American Chemical Paint Co., Ambler, Pa.

FORGING BILLETS—See BILLETS

FORGING MACHINERY
Alliance Machine Co., The, Alliance, O.
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

FORGINGS (Brass, Bronze, Copper)
American Brass Co., The, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.
Titan Metal Mfg. Co., Bellefonte, Pa.

FORGINGS (Drop) (*Also Stainless)
*Atlas Drop Forge Co., Lansing, Mich.
*Bethlehem Steel Co., Bethlehem, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Oil Well Supply Co., Dallas, Texas.

FORGINGS (Hollow Bored)
Atlas Drop Forge Co., Lansing, Mich.
American Hollow Boring Co., 1054 W. 20th St., Erie, Pa.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.

FORGINGS (Iron and Steel) (*Also Stainless)
*Atlas Drop Forge Co., Lansing, Mich.
American Hollow Boring Co., 1054 W. 20th St., Erie, Pa.
Bay City Forge Co., W. 19th and Cranbery Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
*Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
*National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Oil Well Supply Co., Dallas, Texas.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
*Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

FORGINGS (Upset)
Atlas Drop Forge Co., Lansing, Mich.
Bethlehem Steel Co., Bethlehem, Pa.

FROGS AND SWITCHES
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.

FURNACE INSULATION—See INSULATION

FURNACES (Blast)
Brassert, H. A., & Co., 310 So. Michigan Ave., Chicago, Ill.

FURNACES (Brazing)
American Gas Furnace Co., Elizabeth, N. J.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.

FURNACES (Electric Heating)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.

FURNACES (Electric Melting)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
General Electric Co., Schenectady, N. Y.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.

FURNACES (Forging)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Gas Furnace Co., Elizabeth, N. J.
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Galvanizing)
Salem Engineering Co., 714 So. Broadway, Salem, O.
Spowers, W. H., Jr., 551 Fifth Ave., New York City.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.

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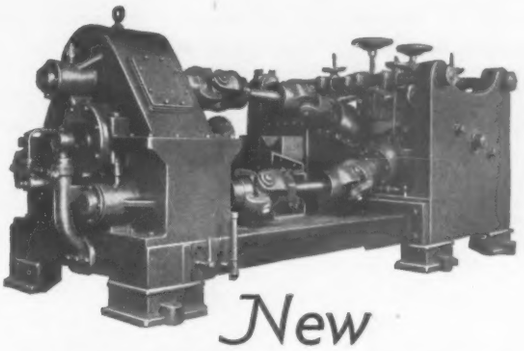
American Gas Furnace Co., Elizabeth, N. J.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Heat Treating, Annealing, Carburizing, Hardening, Tempering)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Gas Furnace Co., Elizabeth, N. J.
Carborundum Co., The, Perth Amboy, N. J.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.



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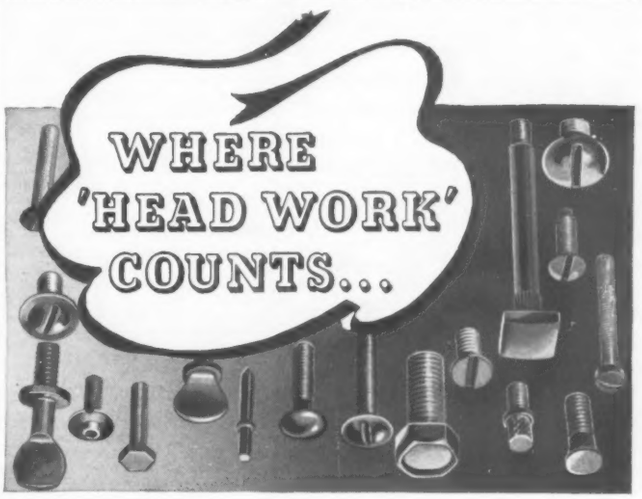

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Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.

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American Gas Furnace Co., Elizabeth, N. J.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.

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American Gas Furnace Co., Elizabeth, N. J.

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Lindemuth, Lewis B., 134 E. 47th St., New York City.

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Surface Combustion Corp., 2375 Dorr St., Toledo, O.

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Salem Engineering Co., Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

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Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
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Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

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Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
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Riverside Foundry & Galvanizing Co., Kalamazoo, Mich.
Standard Galvanizing Co., Chicago, Ill.
Wilcox, Crittenden & Co., Inc., Middletown, Conn.
Witt Cornice Co., The, Cincinnati, O.

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Spowers, W. H., Jr., 551 Fifth Ave., New York City.

GALVANIZING PLANTS FOR SHEETS
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Wean Engineering Co., Warren, O.

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Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

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Petroleum Iron Works Co., Sharon, Pa.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

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Morgan Construction Co., Worcester, Mass.
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Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.
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Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

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Peabody Engineering Corp., 580 Fifth Ave., New York City.
Research Corp., 405 Lexington Ave., New York City.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

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GAGES (Draft)
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National-Erie Corp., Erie, Pa.
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Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.
Waldron, John, Corp., New Brunswick, N. J.

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Simonds Gear & Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.

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Grant Gear Works, 2nd and B Sts., Boston, Mass.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1114 W. Monroe St., Chicago, Ill.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
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National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., 2501 Liberty Ave., Pittsburgh, Pa.
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Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
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Reliance Electric & Mfg. Co., 1088 Ivanhoe Rd., Cleveland, O.

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Reliance Electric & Mfg. Co., 1088 Ivanhoe Rd., Cleveland, O.
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Tri-Lok Co., Neville Island, Pittsburgh, Pa.

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Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Norton Co., Worcester, Mass.

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Heald Machine Co., Worcester, Mass.

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Excelsior Tool & Machine Co., Ridge and Jefferson Aves., East St. Louis, Ill.

GRINDING MACHINES (Tool and Cutter)
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Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

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Carborundum Co., The, Niagara Falls, N. Y.
Norton Co., Worcester, Mass.

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Brosius, Edgar E., Inc., Sharpsburg, Pa.

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Simonds Saw & Steel Co., Fitchburg, Mass.

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Ingersoll-Rand Co., 11 Broadway, New York City.

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Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

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Alliance Machine Co., The, Alliance, O.
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Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

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HARDENING—See Case HARDENING

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American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Ford Chain Block Co., York, Pa.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
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American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
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Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

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Ingersoll-Rand Co., 11 Broadway, New York City.

HOOKS (Chain)
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Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell St., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., Youngstown, O.

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American Brass Co., The, American Metal Hose Branch, Waterbury, Conn.

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Chambersburg Engineering Co., Chambersburg, Pa.
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Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Lake Erie Engineering Corp., Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

HYDRAULIC PRESSES—See PRESSES (Hydraulic)

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INHIBITORS
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Parkin, Wm. M., Co., The, 1005 Highland Bldg., Pittsburgh, Pa.

INSTRUMENTS (Electric Indicating and Recording)
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
General Electric Co., Schenectady, N. Y.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

INSULATING BLOCK
Armstrong Cork Products Co., Lancaster, Pa.
Johns-Manville Corp., 22 E. 40th St., New York City.

INSULATING BRICK
Armstrong Cork Products Co., Lancaster, Pa.
Johns-Manville Corp., 22 E. 40th St., New York City.

INSULATING POWDER AND CEMENT
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Armstrong Cork Products Co., Lancaster, Pa.
Babcock & Wilcox Co., The, 19 Rector St., New York City.

INSULATION (Furnace, Boiler Settings, Ovens, Steam Pipe, Etc.)
Armstrong Cork Products Co., Lancaster, Pa.
Johns-Manville Corp., 22 E. 40th St., New York City.

IRON (Bar)
Ryerson, Jos. T., & Son Co., 16th & Rockwell Sts., Chicago, Ill.

IRON ORE
Alan Wood Steel Co., Conshohocken, Pa.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., The, Youngstown, O.

JIGS AND FIXTURES
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.

KETTLES (Galvanizing)
Petroleum Iron Works Co., Sharon, Pa

KEYS (Machine)
Moltrup Steel Products Co., Beaver Falls, Pa.

KEYS (Woodruff)
Moltrup Steel Products Co., Beaver Falls, Pa.

KNIVES (Rotary)
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.
Cowles Tool Co., 2086 W. 110th St., Cleveland, O.

KNIVES (Shear, Solid Steel, Flying)
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.

LABORATORY WARE
Norton Company, Worcester, Mass.

LACQUERS
Sipe, James B., & Co., Inc., So. Hills Branch, Pittsburgh, Pa.

LADLES
Petroleum Iron Works Co., Sharon, Pa.

LAMPS (Filaments)
General Electric Co., Nela Park, Cleveland, O.

LAMPS (Mercury Vapor)
General Electric Vapor Lamp Co., 885 Adams St., Hoboken, N. J.

LAMPS (Neon Glow)
General Electric Vapor Lamp Co., 885 Adams St., Hoboken, N. J.

LAPPING MACHINES
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.

LARRIES (Coal)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

LATHES
LeBlond, R. K., Machine Tool Co., 269- Madison Rd., Cincinnati, O.

LATHES (Automatic)
Jones & Lamson Machine Co., Springfield, Vt.

LATHES (Roll Turning)
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

LATHES (Turret)
Bullard Company, The, Bridgeport, Conn.
Jones & Lamson Machine Co., Springfield, Vt.

LATHES (Turret) (Automatic Vertical)
Bullard Company, The, Bridgeport, Conn.

LEAD (Chemical, Corroding, Desilvered)
St. Joseph Lead Co., 250 Park Ave., New York City.

LEAD (Tellurium)
National Lead Co., 111 Broadway, New York City.

LEVELING MACHINES
Erie Foundry Co., Erie, Pa.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
McKay Machine Co., Youngstown, O.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

LIGHT OIL RECOVERY & TREATMENT EQUIPMENT
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

LIFT TRUCKS—See TRUCKS (Lift)

LIFTING MAGNETS—See MAGNETS (Lifting)

LIGHTING (Industrial)
General Electric Vapor Lamp Co., 885 Adams St., Hoboken, N. J.

LINERS (Pump and Cylinder)
Shenango-Penn Mold Co., Dover, O.

LININGS—for Soaking Pits and Ladles
National Stone Co., Ellwood City, Pa.

LOCOMOTIVE CRANES—See CRANES (Locomotive)

LOCOMOTIVES (Diesel-Electric)
Plymouth Locomotive Works, Plymouth, O.
Whitcomb Locomotive Div., The Baldwin Locomotive Works, Paschall P. O., Philadelphia, Pa.

LOCOMOTIVES (Diesel Mechanical)
Plymouth Locomotive Works, Plymouth, O.
Whitcomb Locomotive Div., The Baldwin Locomotive Works, Paschall P. O., Philadelphia, Pa.

LOCOMOTIVES (Electric Trolley)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Division, The Baldwin Locomotive Works, Paschall P. O. Sta., Philadelphia, Pa.

LOCOMOTIVES (Gasoline-Electric)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Division, The Baldwin Locomotive Works, Paschall P. O., Philadelphia, Pa.

LOCOMOTIVES (Gasoline Mechanical)
Whitcomb Locomotive Div., The Baldwin Locomotive Works, Paschall P. O., Philadelphia, Pa.

LOCOMOTIVES (Oil-Electric)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Ingersoll-Rand Co., 11 Broadway, New York City.
Whitcomb Locomotive Division, The Baldwin Locomotive Works, Paschall P. O. Sta., Philadelphia, Pa.

LOCOMOTIVES (Storage Battery)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Division, The Baldwin Locomotive Works, Paschall P. O. Sta., Philadelphia, Pa.

LUBRICANTS (Industrial)
American Lanolin Corp., Railroad St., Lawrence, Mass.
Gulf Oil Corp. of Penna., Gulf Refining Co., 3800 Gulf Bldg., Pittsburgh, Pa.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
New York & New Jersey Lubricant Co., 292 Madison Ave., New York City.
Penola, Inc., 34th & Smallman Sts., Pittsburgh, Pa.
Pure Oil Co., The, 35 E. Wacker Dr., Chicago, Ill.
Shell Oil Co., Inc., 50 W. 50th St., New York City.
Socony Vacuum Oil Co., Inc., 26 Broadway, New York City.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.

LUBRICATING SYSTEMS
Farval Corp., 3270 E. 80th St., Cleveland, O.

MACHINE WORK
Budd, Edw. G., Mfg. Co., 25th St. & Huntington Park Ave., Philadelphia, Pa.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.

MACHINERY (Second Hand)
Marr-Galbreath Machinery Co., 53 Water St., Pittsburgh, Pa.
West Penn Machinery Co., 1208 House Bldg., Pittsburgh, Pa.

MACHINERY (Special)
Alliance Machine Co., The, Alliance, O.
Allis-Chalmers Mfg. Co., The, Milwaukee, Wis.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Brosius, Edgar E., Inc., Sharpsburg, Pa.
Cleveland Punch & Shear Works, 3917 St. Clair Ave., Cleveland, O.
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5301 S. Western Ave., Chicago, Ill.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
National Roll & Fdry. Co., The, Avonmore, Pa.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Oil Well Supply Co., Dallas, Texas.
Shuster, F. B., Co., The, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomas Machine Mfg. Co., Pittsburgh, Pa.
United Engineering & Fdry. Co. First National Bank Bldg., Pittsburgh, Pa.

MAGNESIA (Electrically Fused)
Norton Co., Worcester, Mass.

MAGNETIC SEPARATORS—See SEPARATORS (Magnetic)

MAGNETS (Lifting)
Dings Magnetic Separator Co., 675 Smith St., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

MAGNETS (Separating)
Dings Magnetic Separator Co., 675 Smith St., Milwaukee, Wis.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

MANGANESE METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

MANGANESE ORE
Samuel, Frank, Co., Inc., Harrison Bldg., Philadelphia, Pa.

MANIPULATORS
Alliance Machine Co., The, Alliance, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind
Morgan Engineering Co., The, Alliance, O.

MARKERS (Industrial)
Helmer-Staley, Inc., 325 W. Huron St., Chicago, Ill.

MARKING DEVICES
Helmer-Staley, Inc., 325 W. Huron St., Chicago, Ill.

METAL (Perforated)—See PERFORATED METAL

METAL BLAST ABRASIVES (Shot and Grit)
Pittsburgh Crushed Steel Co., 61st St. and A. V. R. R., Pittsburgh, Pa.

METAL CLEANERS
American Chemical Paint Co., Ambler, Pa.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

METAL SPECIALTIES AND PARTS—See STAMPINGS

METAL STAMPINGS—See STAMPINGS

METALS (Nonferrous)
International Nickel Co., Inc., The, 67 Wall St., New York City.

MICROMETERS
Brown & Sharpe Mfg. Co., Providence, R. I.

MILLING MACHINES
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.

MILLING MACHINES (Milling and Centering Combined)
Jones & Lamson Machine Co., Springfield, Vt.

MILLS (Blooming, Universal, Plate, Sheet, Tin, Bar, Strip, Etc.)—See ROLLING MILL EQUIPMENT

MOLDS (Ingot)—See INGOT MOLDS

MOLYBDENUM
Climax Molybdenum Co., 500 Fifth Ave., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

MONEL METAL (All Commercial Forms)
International Nickel Co., Inc., The, 67 Wall St., New York City.

MONORAIL SYSTEMS
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.

MONORAIL SYSTEMS—Con.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

MOTORS (Electric)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Chicago Electric Co., 1318 W. Cermak Rd., Chicago, Ill.
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-7.
Reliance Electric & Mfg. Co., 1088 Ivanhoe Rd., Cleveland, O.
Sawyer Electrical Mfg. Co., 5715 Leneve St., Los Angeles, Cal.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Wagner Electric Corp., 4904 Baum Blvd., Pittsburgh, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MUCK BAR
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

NAILS
(*Also Stainless)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

NAILS (Coated and Galvanized)
Wickwire Brothers, 189 Main St., Cortland, N. Y.

NICKEL (All Commercial Forms)
International Nickel Co., Inc., The, 67 Wall St., New York City.

NICKEL (Shot)
International Nickel Co., Inc., The, 67 Wall St., New York City.

NICKEL STEEL (Cold Drawn)
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Republic Steel Co., Dept. ST, Cleveland, O.
Union Drawn Steel Co., Massillon, O.

NUTS
(*Also Stainless)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap & Screw Co., 2935 E. 79th St., Cleveland, O.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Tinnerman Stove & Range Co., 2039 Fulton Rd., Cleveland, O.

NUTS (Castellated)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Cold Punched)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Hot Pressed)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Semi-Finished)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Wing)
Parker-Kalon Corp., 200 Varick St., New York City.

OIL RETAINERS AND SEALS
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

OILS (Cutting)
Gulf Oil Corp. of Penna., Gulf Refining Co., 3800 Gulf Bldg., Pittsburgh, Pa.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Penola, Inc., 34th & Smallman Sts., Pittsburgh, Pa.
Pure Oil Co., The, 35 E. Wacker Dr., Chicago, Ill.
Shell Oil Co., Inc., 50 W. 50th St., New York City.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.
Socony-Vacuum Oil Co., Inc., 26 Broadway, New York City.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.

OILS (Drawing)
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.

OILS (Lubricating)—See LUBRICANTS (Industrial)

OILS (Paint)
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

OILS (Rust Preventive)
American Chemical Paint Co., Ambler, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

OPEN-HEARTH FURNACES—See FURNACES (Open-Hearth)

OVENS (Annealing, Japanning, Tempering)
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.

OVENS (Coke, By-Product Recovery)
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.

OVENS (Core and Mold)
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.

OXY-ACETYLENE WELDING AND CUTTING—See WELDING

OXYGEN IN CYLINDERS
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.

PACKING (Asbestos or Rubber)
Goodyear Tire & Rubber Co., Akron, O.
Johns-Manville Corp., 22 E. 40th St., New York City.
United States Rubber Co., 1790 Broadway, New York City.

PACKINGS—MECHANICAL LEATHER (Cup, U-Cup, Flange and Vees)
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.

PAINT (Alkali Resisting)
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Aluminum)
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Heat Resisting)
American Chemical Paint Co., Ambler, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Industrial)
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Marking)
Helmer-Staley, Inc., 325 W. Huron St., Chicago, Ill.
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Pretreatment)
American Chemical Paint Co., Ambler, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Rust Preventive)
American Chemical Paint Co., Ambler, Pa.
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Stick Form)
Helmer-Staley, Inc., 325 W. Huron St., Chicago, Ill.

PERFORATED METAL
Chicago Perforating Co., 2443 W. 24th Pl., Chicago, Ill.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

PHENOL RECOVERY PLANTS
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

PICKLING COMPOUND
American Chemical Paint Co., Ambler, Pa.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Parkin, Wm. M., Co., The, 1005 Highland Bldg., Pittsburgh, Pa.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

PICKLING EQUIPMENT
International Nickel Co., Inc., The, 67 Wall St., New York City.

PICKLING MACHINERY
Erie Foundry Co., Erie, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

PICKLING TANK LININGS
American Hard Rubber Co., 11 Mercer St., New York City.
Keagler Brick Co., 1443 W. Market St., Steubenville, O.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa

PICKLING TANKS—See TANKS (Pickling)

PIERCER POINTS
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

PIG IRON
Alan Wood Steel Co., Conshohocken, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Brooke, E. & G., Iron Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Jackson Iron & Steel Co., Jackson, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Samuel, Frank & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

PILING (Iron and Steel)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 South Dearborn St., Chicago, Ill.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Co., Dept. ST, Cleveland, O.

PILING (Pressure-Treated Wood)
Wood Preserving Corp., The, Koppers Bldg., Pittsburgh, Pa.

PILLOW BLOCKS (Ball)
Ahlberg Bearing Co., 3025 W. 47th St., Chicago, Ill.

PILLOW BLOCKS (Roller Bearing)
Ahlberg Bearing Co., 3025 W. 47th St., Chicago, Ill.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.

PILLOW BOXES
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

PINIONS (Mill)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.
United Engineering & Foundry Co., First National Bank Bldg., Pittsburgh, Pa.

PINS (Taper)
Moltrup Steel Products Co., Beaver Falls, Pa.

PIPE (Brass, Bronze, Copper—Rubber or Rubber Lined)
American Hard Rubber Co., 11 Mercer St., New York City.

PIPE (Brass, Bronze, Copper)
American Brass Co., The, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.
Shenango-Penn Mold Co., Dover, O.

PIPE (New and Used)
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

PIPE (Square and Rectangular)
Youngstown Sheet & Tube Co., Youngstown, O.

PIPE (Steel)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Crane Co., The, 836 So. Michigan Blvd., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.
Youngstown Sheet & Tube Co., The, Youngstown, O.

PIPE BALLS
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

PIPE BENDING
Crane Co., The, 836 So. Michigan Blvd., Chicago, Ill.

PIPE CUTTING AND THREADING MACHINERY
Landis Machine Co., Inc., Waynesboro, Pa.

PIPE ELIMINATORS
Alpha-Lux Co., Inc., 192 Front St., New York City.

» » » WHERE-TO-BUY « « «

PIPE FITTINGS
American Hard Rubber Co., 11 Mercer St., New York City.
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Crane Co., The, 836 So. Michigan Blvd., Chicago, Ill.
Oil Well Supply Co., Dallas, Texas.
Worthington Pump & Machy. Corp., Harrison, N. J.

PIPE LINES (Riveted and Welded)
Bethlehem Steel Co., Bethlehem, Pa.
Petroleum Iron Works Co., Sharon, Pa.

PIPE MILL MACHINERY
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PIPE STRAIGHTENING MACHINERY
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Sutton Engineering Co., McKees Rocks, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PIPE TOOLS
Greenfield Tap & Die Corp., Greenfield, Mass.

PIPING CONTRACTORS
Power Piping Co., Beaver and Western Ave., Pittsburgh, Pa.

PISTON RINGS
American Hammered Piston Ring Div., The Koppers Co., Baltimore, Md.

PISTON RODS
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Heppenstall Co., 47th and Hatfield Sts., Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Union Drawn Steel Co., Massillon, O.

PLANERS AND SHAPERS
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Punch & Shear Works, 3917 St. Clair Ave., Cleveland, O.

PLATE CASTORS
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.

PLATES (Sheared or Universal)
(*Also Stainless)
*Alan Wood Steel Co., Conshohocken, Pa.
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., Middletown, O.
*Bethlehem Steel Co., Bethlehem, Pa.
*Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Worth Steel Co., Claymont, Del.
Youngstown Sheet & Tube Co., The, Youngstown, O.

PLATES (Stainless Clad)
Granite City Steel Co., Granite City, Ill.

PLATES (Steel—Floor)—See FLOORING (Steel)

PLATES (Terne and Tin)—See TIN PLATE

PLUGS (Expansion)
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.

PLUGS (Rolling Mill)
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

PLUGS (Rubber)
Rhoades, R. W., Metaline Co., 50 Third St., Long Island City, N. Y.

POLES (Tubular Steel)
National Tube Co., Frick Bldg., Pittsburgh, Pa.

POLISHING MACHINERY (Tube and Bar)
Medart Co., The, 3500 de Kalb St., St. Louis, Mo.

POLISHING MACHINES, AUTOMATIC (Stainless Steel)
Excelsior Tool & Machine Co., Ridge and Jefferson Aves., East St. Louis, Ill.

POTS (Case Hardening)
Pressed Steel Tank Co., Milwaukee, Wis.

POTS (Melting)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.

PRECIPITATORS (Cottrell Electric)
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

PREHEATERS
Babcock & Wilcox Co., The, 19 Rector St., New York City.

PRESSED METAL PARTS
Stanley Works, The, Pressed Metal Div., New Britain, Conn.

PRESSES
Cleveland Punch & Shear Works, 3917 St. Clair Ave., Cleveland, O.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Tomkins-Johnson Co., 611 N. Mechanics St., Jackson, Mich.

PRESSES (Forging)
Erie Foundry Co., Erie, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PRESSES (Forming and Braking)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.

PRESSES (Hydraulic)
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Lake Erie Engineering Corp., Kenmore Sta., Buffalo, N. Y.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

PRESSES (Punching, Drawing, Coining, Blanking, etc.)
Cleveland Punch & Shear Works, The, 3917 St. Clair Ave., Cleveland, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.

PRESSES (Riveting)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

PRESSES (Scrap Bundling and Baling)
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

PRESSES (Welding)—See WELDERS

PRESSURE VESSELS
Babcock & Wilcox Co., The, 19 Rector St., New York City.

PRODUCER GAS SYSTEMS—See GAS PRODUCER PLANTS

PUG MILLS (For Blast Furnaces and Sintering Plants)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.

PULLEYS (Magnetic)
Dings Magnetic Separator Co., 675 Smith St., Milwaukee, Wis.

PULVERIZERS
American Pulverizer Co., 1249 Macklind Ave., St. Louis, Mo.

PUMP HOUSES
Dravo Corp. (Contracting Div.), Neville Island, Pittsburgh, Pa.

PUMPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Hard Rubber Co., 11 Mercer St., New York City.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas.

PUMPS (Boiler Feed)
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Centrifugal)
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American Hard Rubber Co., 11 Mercer St., New York City.
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
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Worthington Pump & Machinery Corp., Harrison, N. J.

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Vickers, Inc., 1400 Oakman Blvd., Detroit, Mich.
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Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Rotary)
Roper, Geo. D., Co., Rockford, Ill.
Vickers, Inc., 1400 Oakman Blvd., Detroit, Mich.

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Ingersoll-Rand Co., 11 Broadway, New York City.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUNCHES (Multiple)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Punch & Shear Works, The, 3917 St. Clair Ave., Cleveland, O.

PUNCHING AND SHEARING MACHINERY
Beatty Machine & Mfg. Co., Hammond, Ind.
Chambersburg Engineering Co., Chambersburg, Pa.
Cleveland Punch & Shear Works, 3917 St. Clair Ave., Cleveland, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Thomas Machine Mfg. Co., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PYROMETER TUBES
Norton Company, Worcester, Mass.

PYROMETERS
American Gas Furnace Co., Elizabeth, N. J.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

RAIL BREAKERS
National Roll & Foundry Co., The, Avonmore, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

RAILS (New and Relaying)
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

RAILS (Steel)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

RAMS
American Hollow Boring Co., 1054 W. 20th St., Erie, Pa.

REAMERS
Barber Colman Co., 150 Loomis St., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

REAMERS (Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

REAMERS (Sand, Ingot Mold—Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

REBUILT EQUIPMENT
Marr-Galbreath Machinery Co., 53 Water St., Pittsburgh, Pa.
West Penn Machinery Co., 1208 House Bldg., Pittsburgh, Pa

RECEIVERS
Petroleum Iron Works Co., Sharon, Pa.
Pressed Steel Tank Co., Milwaukee, Wis.

RECORDERS (Combustion)
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

RECORDERS (Pressure, Speed, Temperature, Time)
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

REDUCERS (Speed)—See SPEED REDUCERS

REDUCTION GEARS
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
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Babcock & Wilcox Co., The, 19 Rector St., New York City.
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Keagler Brick Co., 1443 W. Market St., Steubenville, O.

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Carborundum Co., The, Perth Amboy, N. J.

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Alpha-Lux Co., Inc., 192 Front St., New York City.

REFRACTORIES (Silica)
Alpha-Lux Co., Inc., 192 Front St., New York City.

REFRACTORIES (Silicon Carbide)
Carborundum Co., The, Perth Amboy, N. J.
Norton Co., Worcester, Mass.

WHERE-TO-BUY

REGULATORS (Pressure)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

REGULATORS (Temperature)
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Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

REINFORCEMENT FABRIC (Electric Welded)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

RESISTORS (Edgewound)
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.

RESISTORS (Graphite Disc)
Allen-Bradley Co., 1326 So. 2nd St., Milwaukee, Wis.

RHEOSTATS (Plating)
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RINGS (Steel)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

RINGS (Welded Steel)
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.
Searles Electric Welding Works, 1850 W. Fulton St., Chicago, Ill.

RINGS (Weldless) (*Also Stainless)
*Midvale Co., The, Nicetown, Philadelphia, Pa.
*Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

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Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

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RIVETERS (Pneumatic)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

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Chambersburg Engineering Co., Chambersburg, Pa.
Shuster, F. B., Co., The, New Haven, Conn.
Tomkins-Johnson Co., 611 N. Mechanics St., Jackson, Mich.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

RIVETS (*Also Stainless)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Progressive Mfg. Co., Torrington, Conn.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
*Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, Pa.

RODS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)
American Brass Co., The, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.

RODS (Drill)
Firth-Sterling Steel Co., McKeesport, Pa.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
Kidd Drawn Steel Co., Aliquippa, Pa.

RODS (Piston)
American Hollow Boring Co., 1054 W. 20th St., Erie, Pa.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

RODS (Rounds, Flats and Shapes) (*Also Stainless)
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
*Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. St., Cleveland, O.
Tennessee Coal, Iron & Railroad Co. Brown Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Titan Metal Mfg. Co., Bellefonte, Pa.
Washburn Wire Co., Phillipsdale, R. I.
Youngstown Sheet & Tube Co., Youngstown, O.

RODS (Steel and Iron)
Firth-Sterling Steel Co., McKeesport, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.

RODS (Welding)—See WELDING RODS

RODS (Wire)—See WIRE PRODUCTS

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Hunt, C. B., & Son, Salem, O.

ROLLERS (Rubber)
Goodyear Tire & Rubber Co., Akron, O.

ROLLING DOORS & SHUTTERS—SEE DOORS & SHUTTERS

ROLLING MILL BEARINGS—See BEARINGS (Rolling Mill)

ROLLING MILL EQUIPMENT
Alliance Machine Co., The, Alliance, O.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Continental Roll & Steel Fdry. Co. E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
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Morgan Construction Co., Worcester, Mass.
Morgan Engineering Co., The, Alliance, O.
National Roll & Foundry Co., The, Avonmore, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

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Lake Erie Engineering Co., Kenmore Sta., Buffalo, N. Y.

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Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
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Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
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Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
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National Roll & Fdry. Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O.
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United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

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Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Sons, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

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Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.

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RUBBER PLUGS—See PLUGS

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Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.

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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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Morgan Engineering Co., The, Alliance, O.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

SAWS (Inserted Tooth, Cold)
Simonds Saw & Steel Co., Fitchburg, Mass.

SAWS (Metal Cutting)
Simonds Saw & Steel Co., Fitchburg, Mass.
Youngstown Sheet & Tube Co., Youngstown, O.

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Dravo Corp. (Machinery Div.), Neville Island, Pittsburgh, Pa.

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Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
Kron Co., The, Bridgeport, Conn.

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Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
Kron Co., The, Bridgeport, Conn.

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American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Kron Co., The, Bridgeport, Conn.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.

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SCRAP BALING PRESSES—See BALING PRESSES

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Erdie Perforating Co., 171 York St., Rochester, N. Y.
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.
Koppers Co., Engineering & Construction Div., Pittsburgh, Pa.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

SCREW EXTRACTORS
Greenfield Tap & Die Corp., Greenfield, Mass.

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Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Hindley Mfg. Co., Valley Falls, R. I.
Progressive Mfg. Co., Torrington, Conn.
Titan Metal Mfg. Co., Bellefonte, Pa.

SCREW MACHINES (Automatic, Single and Multiple Spindle)
Brown & Sharpe Mfg. Co., Providence, R. I.

SCREW PLATES
Greenfield Tap & Die Corp., Greenfield, Mass.

SCREW STOCK—See STEEL (Screw Stock)

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Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Parker-Kalon Corp., 200 Varick St., New York City.
Progressive Mfg. Co., Torrington, Conn.

SCREWS (Cap, Set, Safety-Set)
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Standard Pressed Steel Co., Stewart Ave., & Kenmire St., Jenkintown, Pa.

SCREWS (Cold Headed)
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.

SCREWS (Conveyor)
Lee Spring Co. Inc., 30 Main St., Brooklyn, N. Y.

SCREWS (Drive)
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS (Hardened Self-Tapping)
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS (Machine)
Progressive Mfg. Co., Torrington, Conn.

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Continental Screw Co., New Bedford, Mass.
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Lamson & Sessions Co., The, Cleveland, O.
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American Screw Co., Providence, R. I.
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Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, Cleveland, O.
National Screw & Mfg. Co., Cleveland, O.
Parker-Kalon Corp., New York City.
Pheoll Mfg. Co., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

SCREWS (Socket, Cold Forged)
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS (Socket, Head, Cap)
Standard Pressed Steel Co., Stewart Ave., & Kenmire St., Jenkintown, Pa.

SCREWS (Thumb)
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS (Wood, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, Cleveland, O.
National Screw & Mfg. Co., Cleveland, O.
Pheoll Mfg. Co., Chicago, Ill.

SEAMLESS STEEL TUBING—See TUBES

SEPARATORS (Magnetic)
Dings Magnetic Separator Co., 675 Smith St., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

SEPARATORS (Sand)
Dings Magnetic Separator Co., 675 Smith St., Milwaukee, Wis.

SHAFT HANGERS—See HANGERS (Shaft)

SHAFTING
American Hollow Boring Co., 1054 W. 20th St., Erie, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
LaSalle Steel Co., P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

SHAFTS (Clutch)
American Hollow Boring Co., 1054 W. 20th St., Erie, Pa.

SHAPERS
Cincinnati Shaper Co., Garrard and Elam Sts., Cincinnati, O.

SHAPES (Brass, Bronze, Nickel Silver)
Titan Metal Mfg. Co., Bellefonte, Pa.

SHAPES (Steel)—See STEEL (Structural)

SHAPES, SPECIAL (Steel)
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pressed Steel Tank Co., Milwaukee, Wis.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

SHEAR BLADES
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.
Cleveland Punch & Shear Works, The, 3917 St. Clair Ave., Cleveland, O.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.

SHEARS
Beatty Machine & Mfg. Co., Hammond, Ind.
Cincinnati Shaper Co., Garrard and Elam Sts., Cincinnati, O.
Cleveland Punch & Shear Works, The, 3917 St. Clair Ave., Cleveland, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Thomas Machine Mfg. Co., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

SHEET BARS
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEET LIFTERS AND CARRIERS
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
J-B Engineering Sales Co., New Haven, Conn.

SHEET METAL PRODUCTS—See STAMPINGS

SHEET METAL WORKERS MACHINES
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Excelsior Tool & Machine Co., Ridge and Jefferson Aves., East St. Louis, Ill.
Niagara Machine & Tool Works 637 Northland Ave., Buffalo, N. Y.

SHEET STEEL ASSEMBLIES (Fabricated)
Budd, Edw. G., Mfg. Co., 25th St. & Huntington Park Ave., Philadelphia, Pa.

SHEET STEEL PILING (New and Used)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

SHEETS (Acid Resisting)
International Nickel Co., Inc., The 67 Wall St., New York City.

SHEETS (Black)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Andrews Steel Co., The, Newport, Ky.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

WHERE-TO-BUY

SHEETS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)
American Brass Co., The, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.

SHEETS (Corrugated)
American Rolling Mill Co., The, Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Deep Drawing and Stamping)
Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Electrical)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Galvanized)
American Rolling Mill Co., The, Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Hot Rolled and Hot Rolled Annealed)
Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Long Terne)
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Perforated)
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.

SHEETS (Reinforced)
Erdle Perforating Co., 171 York St., Rochester, N. Y.

SHEETS (Roofing)—See ROOFING AND SIDING

SHEETS (Stainless)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Massillon, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.

SHEETS (Stainless Clad)
Granite City Steel Co., Granite City, Ill.

SHEETS (Tin)—See TIN PLATE

SHEETS (Tin Mill Black)
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

SHEETS—HIGH FINISH (Automobile, Metal Furniture, Enameling)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.

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NEW BRITAIN, CONN. - BRIDGEPORT, CONN.
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SHEETS—HIGH FINISH—Con.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SIEVES—See SCREENS AND SIEVES

SILICO-MANGANESE
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

SILICON METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

SKELP (Steel)
Alan Wood Steel Co., Conshohocken, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

SLAG GRANULATING MACHINES (Blast Furnace and Open Hearth)
Brosius, Edgar E., Inc., Sharpsburg, Pa.

SMALL TOOLS
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, O.

SOAKING PITS
Amsler-Morton Co., Fulton Bldg., Pittsburgh, Pa.
Criswell, James, Co., Keenan Bldg., Pittsburgh, Pa.
Salem Engineering Co., 714 S. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

SOLVENT (Degreasing)
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

SPACING TABLES
Thomas Machine Mfg. Co., Pittsburgh, Pa.

SPECIAL MACHINERY—See MACHINERY (Special)

SPEED REDUCERS
Cleveland Worm & Gear Co. 3249 E. 80th St., Cleveland, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5301 S. Western Ave., Chicago, Ill.
Grant Gear Works, 2nd and B Sts., Boston, Mass.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1114 W. Monroe St., Chicago, Ill.
Jones, W. A., Fdry. & Mach. Co., 4401 W. Roosevelt Rd., Chicago, Ill.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.
New Departure Div., General Motors Corp., Bristol, Conn.

SPIEGELEISEN
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
New Jersey Zinc Co., 160 Front St., New York City.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

SPIKES (Screw)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., Youngstown, O.

SPINDLES (Lathe)
American Hollow Boring Co., 1054 W. 20th St., Erie, Pa.

SPLICE BARS (Rail)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.

SPRINGS (*Also Stainless)
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Duer Spring & Mfg. Co., Pittsburgh, Pa.
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Raymond Mfg. Co., Div. Associated Spring Corp., Corry, Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Washburn Wire Co., 118th St. & Harlem River, New York City.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

SPRINGS (Alloy)
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.

SPRINGS (Coil and Elliptic)
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.

SPRINGS (Oil Tempered—Flat)
Davis Brake Beam Co., Laurel Ave., & P. R. R., Johnstown, Pa.

SPROCKETS
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.

SPRUE CUTTERS
Shuster, F. B., Co., The, New Haven, Conn.

STACKS (Steel)—See BRIDGES, ETC.

STAINLESS STEEL—See BARS, SHEETS, STRIP, PLATES, ETC.

STAMPINGS
American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn.
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Budd, Edw. G., Mfg. Co., 25th St. & Huntington Park Ave., Philadelphia, Pa.
Crosby Co., The, 183 Pratt St., Buffalo, N. Y.
Davis Brake Beam Co., Laurel Ave., & P. R. R., Johnstown, Pa.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.
Pressed Steel Tank Co., Milwaukee, Wis.
Raymond Mfg. Co., Div. Associated Spring Corp., Corry, Pa.
Stanley Works, The, New Britain, Conn.
Toledo Stamping & Mfg. Co., 99 Fearing Blvd., Toledo, O.
Whitehead Stamping Co., 1661 W. Lafayette Blvd., Detroit, Mich.

STAPLES (Wire)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

STARTERS (Electric Motor)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

STEEL (Alloy)
Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Simonds Saw & Mfg. Co., Fitchburg, Mass.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Washburn Wire Co., Phillipsdale, R. I.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

STEEL (Alloy, Cold Finished)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
LaSalle Steel Co., P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Union Drawn Steel Co., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

STEEL (Clad—Corrosion Resisting) (*Also Stainless)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
*Granite City Steel Co., Granite City, Ill.
Superior Steel Corp., Carnegie, Pa.

STEEL (Cold Drawn)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Kidd Drawn Steel Co., Aliquippa, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

STEEL (Cold Finished)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
LaSalle Steel Co., P. O. Box 6800-A, Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

STEEL (Corrosion Resisting)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Firth-Sterling Steel Co., McKeesport, Pa.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Superior Steel Corp., Carnegie, Pa.
Timken Steel & Tube Co., Canton, O.

STEEL (Die)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.

STEEL (Drill)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.

STEEL (Electric)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Firth-Sterling Steel Co., McKeesport, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.
Latrobe Electric Steel Co., Latrobe, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Timken Steel & Tube Co., Canton, O.

STEEL (High Speed)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop, Wm., & Sons Co., 121 Varick St., New York City.
Latrobe Electric Steel Co., Latrobe, Pa.

STEEL (High Tensile, Low Alloy)
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Nitriding)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.

STEEL (Rustless)—See STEEL (Corrosion Resisting)

STEEL (Screw Stock)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.

STEEL (Screw Stock)—Con.
LaSalle Steel Co., P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Spring)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.
Washburn Wire Co., 118th St. & Harlem River, New York City.

STEEL (Stainless)—See STEEL (Corrosion Resisting)

STEEL (Strip, Copper Coated)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Thomas Steel Co., Warren, O.

STEEL (Strip, Hot and Cold Rolled) (*Also Stainless)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., The, Middletown, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
*Firth-Sterling Steel Co., McKeesport, Pa.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Republic Steel Corp., Dept. ST, Cleveland, O.
*Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
*Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Superior Steel Corp., Carnegie, Pa.
Tennessee Coal, Iron & Railroad Co. Brown Marx Bldg., Birmingham, Ala.
Thomas Steel Co., Warren, O.
Washburn Wire Co., 118th St. & Harlem River, New York City.
Weirton Steel Co., Weirton, W. Va
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

STEEL (Strip, Tin Coated)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Thomas Steel Co., The, Warren, O
Washburn Wire Co., 118th St. & Harlem River, New York City.

STEEL (Strip, Zinc Coated)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Thomas Steel Co., Warren, O.
Washburn Wire Co., 118th St. & Harlem River, New York City.

STEEL (Structural) (*Also Stainless)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Belmont Iron Works, 22nd St. and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Tool)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Darwin & Milner, Inc., 1260 W. 4th St., Cleveland, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop, Wm., & Sons Co., 121 Varick St., New York City.
Kidd Drawn Steel Co., Aliquippa, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.

STEEL BUILDINGS—See BRIDGES, BUILDINGS, ETC.

STEEL DOORS & SHUTTERS—See DOORS & SHUTTERS

STEEL FABRICATORS—See BRIDGES, BUILDINGS, ETC.

STEEL FLOATING AND TERMINAL EQUIPMENT
Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.

STEEL PLATE CONSTRUCTION
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Belmont Iron Works, 22nd St., and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

STELLITE
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.

STOKERS
Babcock & Wilcox Co., The, 19 Rector St., New York City.

STOPPERS (Cinder Notch)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa
Brosius, Edgar E., Inc., Sharpsburg, Pa.

STORAGE BATTERIES—See BATTERIES (Storage)

STRAIGHTENING MACHINERY
Cleveland Punch & Shear Works, The, 3917 St. Clair Ave., Cleveland, O.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Lewis Machine Co., 3438 E. 76th St., Cleveland, O.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Medart Co., The, 3500 de Kalb St., St. Louis, Mo.
Shuster, F. B., Co., The, New Haven, Conn.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.

SULPHURIC ACID
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
New Jersey Zinc Co., 160 Front St., New York City.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

SWITCHES (Electric)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.
General Electric Vapor Lamp Co., 885 Adams St., Hoboken, N. J.

TACHOMETERS
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.

TANKS (Pickling)
American Hard Rubber Co., 11 Mercer St., New York City.
Goodyear Tire & Rubber Co., Akron, O.
United States Rubber Co., 1790 Broadway, New York City.

TANKS (Quenching, Automatic)
American Gas Furnace Co., Elizabeth, N. J.

TANKS (Storage, Pressure, Riveted, Welded)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Pressed Steel Tank Co., Milwaukee, Wis.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

TANKS—WOOD OR STEEL (Rubber or Lead Lined)
American Hard Rubber Co., 11 Mercer St., New York City.
Goodyear Tire & Rubber Co., Akron, O.
United States Rubber Co., 1790 Broadway, New York City.

TAPS AND DIES
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Machine Co., Inc., Waynesboro, Pa.

TERNE PLATE—See TIN PLATE

TESTING MACHINES (Moisture Tester)
Alpha-Lux Co., Inc., 192 Front St., New York City.

THERMOMETERS
Brown Isntrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

THREAD CUTTING TOOLS
Landis Machine Co., Inc., Waynesboro, Pa.

TIE PLATES
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

TIN PLATE
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TIN PLATE MACHINERY
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Wean Engineering Co., Warren, O.

TITANIUM
Vanadium Corp. of America, 420 Lexington Ave., New York City.

TONGS (Rail Handling)
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.

TOOL BITS (High Speed)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.

TOOLS (Pneumatic)
Cleveland Punch & Shear Works, 3917 St. Clair Ave., Cleveland, O.
Ingersoll-Rand Co., 11 Broadway, New York City.

TOOLS (Precision, Lathe, Metal Cutting, etc.)
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TOOLS (Tipped, Carbide)
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TORCHES AND BURNERS (Acetylene, Blow, Oxy-Acetylene)
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.

TORCHES AND BURNERS (Air—Gas)
American Gas Furnace Co., Elizabeth, N. J.

TOWBOATS
Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.

TOWERS (Transmission)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.

TOWERS (Tubular Hoisting)
Dravo Corp. (Machinery Div.), Neville Island, Pittsburgh, Pa.

TRACK ACCESSORIES
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

TRACK BOLTS
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TRAILERS (Arch-Girder)
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRAMRAILS
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRANSFORMERS
Wagner Electric Corp., 4904 Baum Blvd., Pittsburgh, Pa.

TRANSMISSIONS VARIABLE SPEED
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

TRAPS (Steam and Radiator)
Johns-Manville Corp., 22 E. 40th St., New York City.

TREADS (Safety)
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Dravo Corp. (Machinery Div.), Neville Island, Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tri-Lok Co., Neville Island, Pittsburgh, Pa.

TROLLEYS
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRUCKS AND TRACTORS (Electric Industrial)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRUCKS AND TRACTORS (Gasoline Industrial)
Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich.
Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.

TRUCKS (Dump-Industrial)
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.

TRUCKS (Hydraulic Lift)
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.

TRUCKS (Lift)
Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich.
Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TUBE MILL EQUIPMENT
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.

TUBES (Boiler)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Standard Tube Co., The, 14600 Woodward Ave., Detroit, Mich.
Timken Steel & Tube Co., Canton, O.
Youngstown Sheet & Tube Co., Youngstown, O.

TUBES (Brass, Bronze, Copper, Nickel Silver)
American Brass Co., The, American Metal Hose Branch, Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.

TUBING (Alloy Steel) (*Also Stainless)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Columbia Steel Co., San Francisco, Calif.
*National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Timken Steel & Tube Co., Canton, O.

TUBING (Cold Drawn Seamless Steel)
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Columbia Steel Co., San Francisco, Calif.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Standard Tube Co., The, 14600 Woodward Ave., Detroit, Mich.
Timken Steel & Tube Co., Canton, O.

TUBING (Copper, Brass, Aluminum)
Bundy Tubing Co., 10951 Hern Ave., Detroit, Mich.
Shenango-Penn Mold Co., Dover, O.

TUBING (Phosphor Bronze)
American Brass Co., The, American Metal Hose Branch, Waterbury, Conn.

TUBING (Seamless Flexible Metal)
American Brass Co., The, American Metal Hose Branch, Waterbury, Conn.

TUBING (Welded Steel)
Bundy Tubing Co., 10951 Hern Ave., Detroit, Mich.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Tube Co., The, 14600 Woodward Ave., Detroit, Mich.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUMBLING BARRELS (Coke Testing)
Brosius, Edgar E., Inc., Sharpsburg, Pa.

TUNGSTEN CARBIDE
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.

TUNGSTEN CARBIDE (Tools and Dies)
Firth-Sterling Steel Co., McKeesport, Pa.

TUNGSTEN METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

TURBINES (Steam)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TURBO BLOWERS—See BLOWERS TURNTABLES

American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

TURRET LATHES—See LATHES (Turret)

TWIST DRILLS
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

VACUUM CLEANERS
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

VALVES (Blast Furnace)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg, Pa.

VALVES (Control—Air and Hydraulic)
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

VALVES (Electrically Operated)
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.

VALVES (Gas and Air Reversing)
Blaw-Knox Co., Blawnox, Pa.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

VALVES (Gate)
American Chain & Cable Co., Bridgeport, Conn
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Crane Co., The, 836 So. Michigan Blvd., Chicago, Ill.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

VALVES (Gate—Rubber Lined)
American Hard Rubber Co., 11 Mercer St., New York City.

VALVES (Hydraulic)
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Vickers, Inc., 1400 Oakman Blvd., Detroit, Mich.
Wood, R. D., 400 Chestnut St., Philadelphia, Pa.

VALVES (Hydraulic De-Scaling)
Hunt, C. B., & Son, Salem, O.

VALVES (Steam and Water)
American Chain & Cable Co., Bridgeport, Conn.

VALVES AND FITTINGS—See PIPE FITTINGS

VANADIUM
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

VIADUCTS (Steel)—See BRIDGES, ETC.

WALKWAYS—See FLOORING—STEEL

WASHERS (Iron and Steel)
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.
Peoria Malleable Castings Co., Peoria, Ill.

WELDERS (Electric—Arc, Spot, Seam, Flash, Butt, Automatic Projection, Hydromatic, Etc.)
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-7.
Thompson-Gibb Electric Welding Co., Lynn, Mass.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.

WELDING
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Budd, Edw. G., Mfg. Co., 25th St. & Huntington Park Ave., Philadelphia, Pa.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-7.
Searles Electric Welding Works, 1850 W. Fulton St., Chicago, Ill.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

WELDED BASES (Machinery)
Searles Electric Welding Works, 1850 W. Fulton St., Chicago, Ill.

WELDING AND CUTTING APPARATUS AND SUPPLIES (Electric)
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-7.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.
Thompson-Gibb Electric Welding Co., Lynn, Mass.
Wilson Welder & Metals Co., 60 E. 42nd St., New York City.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

WELDING AND CUTTING APPARATUS AND SUPPLIES (Oxy-Acetylene)
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.

WELDING RODS (Alloys)
American Agile Corp., 5806 Hough Ave., Cleveland, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-7.
Maurath, Inc., 7311 Union Ave., Cleveland, O.
Metal & Thermit Corp., 120 Broadway, New York City.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.

WELDING RODS (Bronze)
Titan Metal Mfg. Co., Bellefonte, Pa.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.

WELDING RODS OR WIRE
Air Reduction Sales Co., 60 East 42nd St., New York City.
American Agile Corp., 5806 Hough Ave., Cleveland, O.
American Brass Co., The, 25 Broadway, New York City.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bridgeport Brass Co., Bridgeport, Conn.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-7.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
Maurath, Inc., 7311 Union Ave., Cleveland, O.
Metal & Thermit Corp., 120 Broadway, New York City.
Page Steel & Wire Co., Monessen, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Washburn Wire Co., Phillipsdale, R. I.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.
Wilson Welder & Metals Co., 60 East 42nd St., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WHEELS (Car and Locomotive)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.

WHEELS (Track)
National-Erie Corp., Erie, Pa.

WINCHES (Electric)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

WIRE (Alloy Steel) (*Also Stainless)
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
Page Steel & Wire Co., Monessen, Pa.
*Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

WIRE (Annealed, Bright, Galvanized)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Page Steel & Wire Co., Monessen, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE (Barb)
Bethlehem Steel Co., Bethlehem, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., Youngstown, O.

WHERE-TO-BUY

WIRE (Brass)

Titan Metal Mfg. Co., Bellefonte, Pa.

WIRE (Cold Drawn)

Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Washburn Wire Co., 118th St. & Harlem River, New York City.

WIRE (High Carbon)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Washburn Wire Co., 118th St. and Harlem River, New York City.

WIRE (Music)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Washburn Wire Co., 118th St. and Harlem River, New York City.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

WIRE (Round, Flat, Square, Special Shapes)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., Los Angeles, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee, Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Washburn Wire Co., 118th St. and Harlem River, New York City.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE (Spring)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Washburn Wire Co., 118th St. & Harlem River, New York City.

WIRE (Stainless)

Firth-Sterling Steel Co., McKeesport, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.

WIRE (Threaded)

Progressive Mfg. Co., Torrington, Conn.

WIRE (Welding)—See WELDING RODS OR WIRE

WIRE AND CABLE (Electric)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Anaconda Wire & Cable Co., 25 Broadway, New York City.

WIRE BUGGIES

Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

WIRE CLOTH

Cyclone Fence Co., Waukegan, Ill.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

WIRE FORMS, SHAPES AND SPECIALTIES

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
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Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Lewis Machine Co., 3438 E. 76th St., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Shuster, F. B., Co., The, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE NAILS—See NAILS

WIRE PRODUCTS (*Also Stainless)

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Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Leschen, A., & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.
Page Steel & Wire Co., Monessen, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Searles Electric Welding Works, 1850 W. Fulton St., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Washburn Wire Co., 118th St. and Harlem River, New York City.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE ROPE AND FITTINGS (*Also Stainless)

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Bethlehem Steel Co., Bethlehem, Pa.
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Page Steel & Wire Co., Monessen, Pa.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

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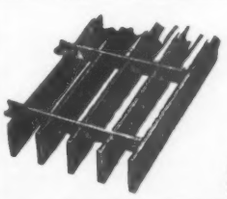

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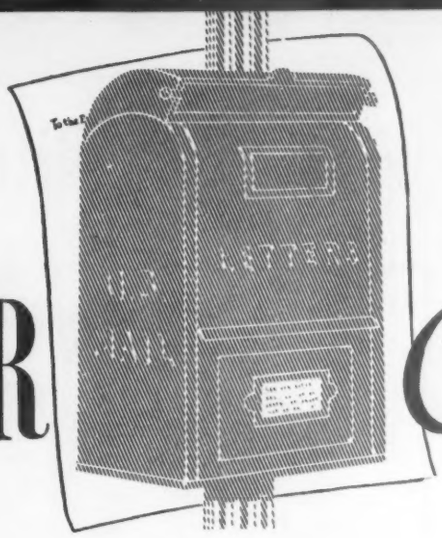

Readers are invited to comment upon articles, editorials, reports, prices or other editorial material appearing in STEEL. The editors cannot publish unsigned communications, but at their discretion may permit a writer to use a pseudonym when a bona fide reason exists for withholding his identity. Letters should be brief—preferably not exceeding 250 words.

Eliminate Wasteful Bulk

To the Editor:

Although I am on record for saying that, "In spite of occasional predictions to the contrary, the iron blast furnace process itself is not likely to become obsolete as the most economical process for the mass reduction of iron from its ores" (*Blast Furnace Practice*, 1938, page 343), I feel that some of the "various methods of by-passing the blast furnace in direct production of steel" do have a greater bearing on the immediate factors confronting the steel industry than Mr. Hartford allows in his most interesting article. (STEEL, June 12, p. 23.)

My reason for this belief is that there is altogether too much dead weight in the manufacture of a ton of hot-rolled sheets. To produce a net ton of sheets from 40 per cent pig iron and 60 per cent scrap it is necessary to handle 2.987 gross tons of raw materials, including 4690 pounds of materials other than iron, or 3.34 pounds of material to 1.00 pound of metal. Too much of this material is nothing but ash, sand and water, costing just as much to produce and to transport as the carbon and iron units necessary to make a pound of steel.

Too Much Dead Weight

This condition, of itself, would not be so onerous if it were not for the fact that this 2.34 pounds of dead weight ("the unrelieved weight of anything inert," Webster) calls for just as much capital investment per pound, at the mines, on the Great Lakes, on the railroads, and in the steel plant, as does the pound of iron that is made into steel.

Not all this excess ash in coking coal and excess gangue and moisture in iron ores, to say nothing of the tons of inert nitrogen in the air blast, can be eliminated, but it is imperative that much of this wasteful bulk should be removed from the raw materials at the mines, if the present iron and steel processes are to continue.

Trend Toward Less Waste

This excess cost of wasteful bulk and consequent extra capital investment, together with the need for a pure base metal for alloy steels, are the great incentives for the persistent research for "direct reduction" methods. In addition, direct reduction has the prospect of producing a hot metal for the open hearth that will have much less carbon and silicon to be removed by some steel process.

Less carbon in the hot metal means less time for the open-hearth heats, and a corresponding increase of capacity and decreased investment per ton of ingots.

Therefore, the financial and operating trends in the steel industry appear to be toward less wasteful bulk in raw materials, less capital tied up in coal and ore reserves, less plant capital per ton of annual product, and less elapsed time between iron ore and the finished steel.

RALPH H. SWEETSER
Consultant,
Blast furnace practice,
New York

No Foolishness

To the Editor:

In the article (STEEL, June 12, p. 39) on the General Motors proving ground there are two objections that I have. They are not serious, but in one paragraph the statement is made that the favorite stunt of test drivers is to go into the speed loop at 80 miles an hour and take their hands off the steering wheel and ask the visitors for a match. That particular behavior is very much frowned on and is not permitted if we know about it. That paragraph is apt to give the impression that we do some rather foolish things out at the proving ground and it is our intention not to permit any foolish actions at any time on the test track.

The other paragraph that is a bit in error is the one referring to the straightaways. The impression is given that one of the straightaways is on the speed loop. Neither of the straightaways is on the speed loop. They are both individual roads. One runs east and west and the other runs north and south. There is a connection between the speed loop and the straightaways.

I wish to compliment you on the article as a whole and am sorry that the one statement about the behavior of the test drivers on the speed loop appeared because that is not permitted if we know about it, since we endeavor to operate in the safest possible manner at all times.

ERNEST E. WILSON
Assistant Director,
Proving Grounds Section,
General Motors Corp.,
Milford, Mich.

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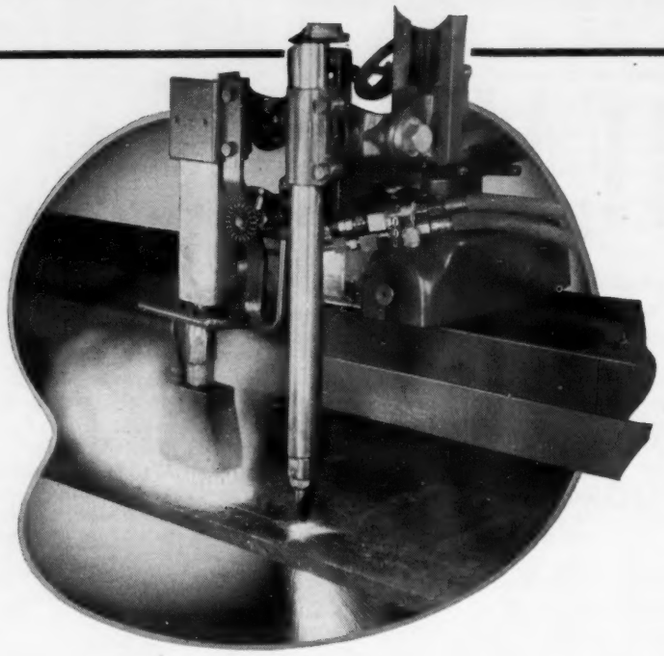

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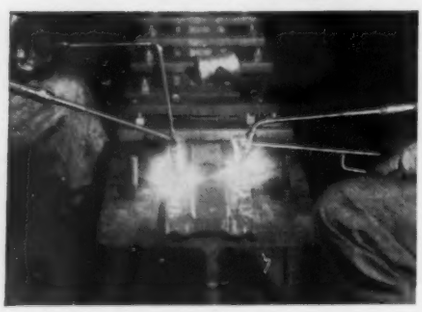

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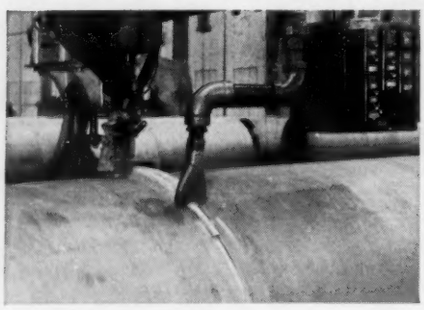

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